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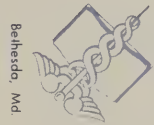
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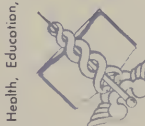
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IN PREPARATION.

By the Same Author.

A PRACTICAL TREATISE
ON THE
DISEASES OF WOMEN.

ONE VOLUME. OCTAVO. FULLY ILLUSTRATED.

AS THE CONDITION OF THIS VOLUME
WOULD NOT PERMIT SEWING, IT WAS
TREATED WITH A STRONG, DURABLE
ADHESIVE ESPECIALLY APPLIED TO
ASSURE HARD WEAR AND USE.

A
PRACTICAL TREATISE
ON
HERNIA.

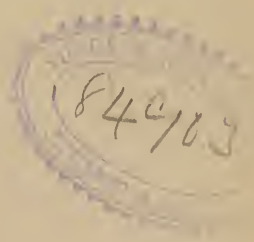
BY

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MEDICAL DIRECTOR U.S.A.; ETC., ETC.

Second and Revised Edition.

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W I

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1881

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UNIVERSITY PRESS:

JOHN WILSON AND SON, CAMBRIDGE.

TO THE
HONORABLE STUDENT AND REGULAR PRACTITIONER
OF MEDICAL ART

IN AMERICA AND IN EUROPE

THIS WORK IS RESPECTFULLY DEDICATED

By the Author.

PREFACE TO THE SECOND EDITION.

THE manner in which the First Edition of this work has been received by the profession is very pleasing to the author. The danger is that he who writes concerning a single operation will be considered an enthusiast. I trust, however, that the intrinsic value of this volume will be evidence that I have approached my subject in the spirit, not of an enthusiast, but of a searcher after truth. I have at all times endeavored to be liberal and impartial in my views and presentations of the various methods that have been employed for the relief and cure of hernia.

The Introduction to the former edition has been entirely omitted, as has also the Appendix, giving urinary instruments of the author. To the original manuscript, a new Introduction and six wholly new and carefully written chapters have been added: Chapter I., Causation of Hernia; Chapter X., Recent Operations for Hernia; Chapter XI., Artificial Anus and Wounds of the Intestines; Chapter XIII., Hydrocele and Varicocele; Chapter XIV., Observations on Hernia; and Chapter XV., Résumé and Clinical Reports.

For the benefit of critics, the author would say that if stereotype plates of the book had not been already cast, many of the additions, which must now be massed together into one chapter, could more appropriately have been introduced in the body of the text. For the benefit of readers, it may, however, be said

that full and convenient references have been made throughout the book to these additions, so that no confusion of thought will result.

Many new illustrations have been added by the heliotype process, besides three beautiful anatomical plates, two of them reproduced from Bourguery, and the third from Blandin. The Index has been revised and enlarged, while the Bibliography has been more than doubled,—the author having given much care in London to the collection of the literature upon the subject.

In addition to all this, what was previously published has been carefully revised, much of it rewritten, and many typographical errors corrected which were previously unavoidable. The microscope has revealed to me nothing that is new in the pathology of plastic lymph in the hernial rings.

While the mere specialist may possibly think the Treatise too condensed in places, and the more general reader too minute in its details, the author has endeavored to take a happy medium, striving, however, to be practical rather than merely theoretical. Thanking the regular profession once more for their kind words of cheer and encouragement, he presents and dedicates to them this volume, which he trusts will be found a thoroughly comprehensive and practical Text-book on Hernia.

51 UNION PARK, BOSTON, MASS., U. S. A.,
July, 1881.

PREFACE.

It has been the author's desire in placing the present work before the medical profession to do so in as concise a form as possible. There seemed to me great need for a work like the one now issued, giving a short sketch of the various operations for the cure of Hernia that are most worthy of mention, in order that the busy practitioner could refer to them without wading through whole volumes.

Much labour has been bestowed upon the little monograph, and very many authors consulted. I have striven, with the time at my command, to make a trustworthy work of reference on Hernia, although it is far from being as perfect or as extended as I should like. It will be found to contain much that is original with the author (the result of the study of Hernia for many years), and never before given to the profession in a printed form. Besides this will be found a condensation of many operations from the French, German, and English. A short Bibliography is given to indicate some of the work that has been devoted in previous years to the subject under consideration.

I am under many obligations to my very kind and generous friends in the profession, both in my own country and in others,

who by encouraging and cheering words have done much to aid me in accomplishing my task. I am under the most particular obligations to my son, Charles Everett Warren, A.B., Student in Medicine, and to my nephew, Willard Everett Smith, A.B., Student in Medicine, for the very great amount of labour and assistance they have rendered me in translating from the French and German, and in compiling these pages. Had it not been for their great interest and assistance I could not at such short notice have prepared the work.

To Messrs. Geo. Tiemann and Co., of New York, I am indebted for great assistance in the perfection of my various instruments, as well as for the loan of several electrotypes. Messrs. Codman, Shurtleff, and Co., of Boston, also supplied several electrotypes, and Dr. Codman has furnished me with an article on trusses.

I am also under obligations to Messrs. Weiss and Son, London, who so readily conceived my ideas in regard to a lithopaxy tube, and other instruments of great beauty and finish.

In conclusion, I would gratefully acknowledge the favour received from Prof. G. Dowell of Texas, and Dr. H. O. Marcy of Cambridge, Mass., whose operations are inserted in the body of the work.

I would express great obligation to Sir Henry Thompson for the favour which he showed me in allowing me to witness his operation for lithopaxy a number of times, and in explaining his operation and instruments to me; also I am grateful to Thomas Bryant for his great kindness to me in allowing me to use illustrations from his work, and for affording me

an opportunity to operate on Herniæ before a number of surgeons at Guy's Hospital.

And also to my very kind friends Dr. Brown Séquard of the College of France, who recommended me to the Academy of Medicine; to Dr. Alphonse Guery, Surgeon to Hôtel Dieu, who very kindly presented me, and explained my instruments more fully at the Academy; and to Dr. Blum, Surgeon to the Hospital Beaujon, who kindly assisted me in my demonstration of the operation for Hernia and other operations with the new instruments of my devising.

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H E R N I A.

INTRODUCTION.

"I believe the time is coming when most cases of reducible hernia will be radically cured by the surgeons, if not of this generation certainly of the next." — Sir T. SPENCER WELLS.

WHILE it is right and fitting that in a Practical Treatise on Hernia we should consider all the various methods and devices that have been suggested for its relief and cure, sufficiently at least to give the student and general practitioner an idea of the field open for more minute study, if any are interested in looking at the subject in its historical aspect, I do not consider it necessary for me at this period of general information and intelligence to develop to their full extent all the operations that have been performed, but will give more special attention to those that seem more worthy of commendation.

"Look not mournfully into the past. It comes not back again. Wisely improve the present. It is thine. Go forth to meet the shadowy future without fear and with a manly heart."

It is altogether probable that from the very earliest times mankind has been afflicted with hernia, even before the dawn of history had given us any records. Many of the ancient operations for the cure of this affection have come down to us from the early surgeons; but it does not tax the ingenuity to any great extent to suppose that the wandering nomadic tribes

of the East, as well as the more noble and civilized builders of the Egyptian pyramids, were conversant both with the disease and methods of its cure. Since every day brings to light new evidences of the culture and civilization of Egypt, it is no great stretch of the imagination to suppose that the Oriental surgeons knew of a subcutaneous injection of some stimulating and astringent fluid into the hernial rings. We know beyond a doubt that from the most remote ends of the inhabited earth patients flocked to the Egyptian surgeons to be healed; and we know that in their process of embalming they showed no want of proper anatomical knowledge, and that they made no little use of the astringent properties of tannin in the abdomen in the preservation of their dead.

Whether our suppositions in regard to their knowledge of injection be true or not, we do not know. We do know that, during the ages of darkness in Europe, surgical knowledge and the treatment of hernia were kept alive by the ancient Arabs who in olden times were remarkable for their scientific attainments. It is altogether probable also that the ancient Israelites, the chosen people of God, were acquainted with hernia and its cause, prevention, and treatment; and if, as we shall see further on, phimosis be a great cause of hernia in children, may it not be that the law of circumcision was divinely given, as well for the prevention of hernia, as for the preservation of cleanliness and the prevention of syphilis and urinary diseases, which, by causing stricture and obstruction, produce straining and consequently herniæ.

That syphilis and gonorrhœa, as well as phimosis, do have a marked influence upon hernia and its treatment, we all know from our professional experience. I have frequently observed that persons who have had extensive suppurations from lues veneria are more liable to have bad and complicated forms of hernia than more healthy persons, because the abundant for-

mation of pus had caused a loosening and weakening of the tissues of the groin. Since the Orientals hated the spilling of blood in their surgical treatments, they made use of poultices and plasters of astringent substances, whether tannin or pomegranate; and it may be that the records will sometime show that they also employed astringents internally for the relief of an affection that must have afflicted them.

The nineteenth century has witnessed a revolution in medical and surgical science. It has seen ether and chloroform giving comfort to both patient and operator, so that operations can now be performed which before our time would never have been dreamed of. It has seen wonderful advances made in the treatment of diseases of the eye, ear, and throat, in the diagnosis of affections of the chest, and in the removal of fluids from the body. Why, it was only in 1856 that I performed the operation of paracentesis thoracis with a thumb lancet and a female catheter. This, I think, was one of the very earliest operations of this kind in this country; yet to-day it is of every-day occurrence in our practice. It has seen surgery made safe by the use of antiseptic precautions; and I thought, while recently assisting a brother physician to remove the entire uterus and ovaries from a suffering woman, that the conservative surgery of the future will save many precious lives for usefulness that our fathers would have given up for lost. We may, therefore, with perfect truth and confidence say that our profession has ever been, and is to-day, fully as progressive in its advance toward scientific perfection as any other branch of art and science.

Let us hail, then, with joyful gladness, all scientific measures that offer to relieve suffering or to save life; and what grander field than hernia is offered for this work! By endeavoring to relieve the sufferings that this scourge entails upon mankind, we shall take no undue praise to ourselves, but we may safely

claim the satisfaction of performing well our duty both to our patients and our profession, and shall preserve in all its sanctity the ever-binding oath of Hippocrates to preserve life and never to destroy it. Let "Droit et Royal" be our motto, and "Vérité dans la Science" our greatest desire in the practice of our art.

Like many other diseases which the profession has pronounced incurable, it has been the fate of hernia to fall into the hands of unscrupulous men, who in every age have obtained a spurious reputation for curing a disease concerning which it is not in some cases easy to decide whether it can be cured or not;—a disease which is not to be distinguished, except by experienced surgeons, from many others which are easily curable. In both ways the public have been deceived repeatedly, and professional men are naturally placed in an attitude of suspicion toward all such attempts to remove the stigma of impotence which in too many instances is fixed upon their art.

In these latter days of attention to the social sciences, we justly consider the physical qualities of races and their deterioration to be of paramount importance. Habits of active exertion and muscular training are encouraged with a view to military, scientific, mercantile, and colonizing pursuits. Doubtless the frequency of hernia, great as it already is, will be thereby increased until these habits have invigorated more than one generation and impressed its influence upon their descendants. Thus has arisen an increasing demand for something to be done for herniæ, leading to the revival of attempts to cure this prevailing deformity, although most of them in the past have proved futile.

Hernia, especially inguinal, is a very common disease, more particularly in those classes of men who are the backbone and support of nations; namely, the laboring, military, and naval classes. The disease renders them incapable, for the most part totally, of the effective performance of their duties, and may

place their lives in jeopardy under circumstances in which their greatest efforts are required and surgical help not available. This result has been found by experience not to be effectually guarded against by the use of trusses, which often fail just when most needed or cause so much trouble and expense that they are discontinued as unprofitable. Before we can obtain a proper light from statistics on this subject, we must compare the total number of deaths from attempted radical cure with those from strangulation and other fatal consequences of hernia, and the proportions of each to the total number of herniæ. This alone will show whether society at large is a gainer by the many radical cures that have been proposed.

It is a question generally asked of the surgeon by the patient, "Is the operation a safe and certain one"? The answer will vary somewhat with the experience and more probably with the individual character of the surgeon. The most reasonable definition of a safe operation seems to be, "an operation which has no peculiar dangers arising from the situation of the parts or the method of procedure, and which is not subject more than others to those accidental diseases which may occasionally follow any interference whatever with the surface of the body, such as erysipelas, tetanus, and pyæmia.

"Next, — is the proportion of success to failure such as to offer to the patient chances of cure which will overbalance the dangers and inconveniences of a hernia treated by a truss more or less efficient? In estimating this, it must be borne in mind that in almost all of the cases called unsuccessful the patient is in a better condition than before the operation, inasmuch as a truss is rendered effective which had previously failed in keeping up the hernia. In none of the cases has the condition of the patient been rendered worse." *

* Wood, on Rupture.

CHAPTER I.

CAUSATION OF HERNIA.

IN the following consideration of hernia, we shall discuss minutely the *Causation of Hernia* in foetal and infantile life, and devote a few more general remarks to its causation in adults. I have deemed this the better arrangement, since the consideration of the former variety of hernia rests upon an exact anatomical and physiological knowledge, and upon conditions which affect both infants and adults, while the causation of the latter variety is more problematical and rests upon many and varied inherited predispositions, as well as upon conditions and habits of life which differ with the individual.

I shall, for these purposes, beg leave to extract freely from many different authors, selecting from each such portions as I shall judge will present to the reader and student the very best and most recent views upon the subjects in question. I wish in this place to acknowledge my very great indebtedness to the writings of Scarpa, Birkett, and John Wood, both for many suggestions and quotations.

Congenital Inguinal Hernia. — As an introduction to the proper understanding of this subject, the following extracts from a paper by Allan Burns, of Glasgow, published in “Munroe’s Outlines of Anatomy,” are very valuable: In the foetus or new-born male, we find that the tendon of the external oblique muscle at its anterior and inferior part separates into two pillars, which leave between them an irregular opening through which

the cord passes. Both pillars inclining toward the crest of the pubes, one is completely lost, the other in part implanted. That fold which passes below the cord is completely implanted into the tough ligament which covers the tubercle of the pubes. The other pillar, when it reaches the pubes, separates into two bands; the posterior or deeper is inserted along the lower pillar into the tubercle of the pubes, and extends even to the opposite side.

The other, and by far the most important band, winds obliquely inward, then bending backward between the penis and the cord, is at last incorporated with the fascia of the triceps, covering the heads of the triceps, the gracilis, and flexor muscles of the leg. In some cases it can be traced much further and reaches even to the tendon of the gluteus maximus, to which it is attached. The slip from the upper pillar of the canal is always inseparably joined to the fascia covering the cremaster; indeed it may perhaps most properly be described as a part of Camper's fascia, *i.e.*, the cremasteric sheath attached to the ring. "I thought," says Burns, "that this structure had not been noticed by any author, but I find that it has not escaped that indefatigable anatomist, Camper." This part of the canal merits peculiar attention, for whoever is ignorant of the position and connection of the production of the upper pillar of the ring can possess only a very confused notion of its action in disease.

When we have examined in the very young subject the structure of the external orifice through which the cord passes, we have seen all that is most worthy of notice; for in the very early part of life, the inguinal canal is not formed. I have never observed the cord in any obvious degree oblique in its course. In an infant at birth, it runs in a straight line from the psoas muscle to the bottom of the scrotum, and passes through a mere aperture. When, however, we take a subject even a month old, we find there is a very apparent obliquity in the course of the cord. If we examine subjects of different ages, we find that

the older they become until they arrive near the age of puberty, so much the longer does the inguinal canal become.

It may be worth while to inquire how the canal comes to be formed, and what changes take place in the neighboring parts. I have already said that the upper and lower openings of the foetal ring are opposite to each other, and so very little distinct the one from the other that there is hardly a calculable space between them. The ring is placed just in contact with the tubercle of the pubes. The lower outlet in the foetus is therefore in the same spot which it is afterwards to occupy in the adult. In proportion therefore as the foetal ring is changed into the adult canal, it is the internal orifice which changes its position. It is the upper opening which ascends toward the spine of the ilium. From this we may very readily understand that it is the gradual extension of the transversalis fascia in this direction which encloses the cord in the canal.

A very simple contrivance gives a very clear idea of the manner in which the inguinal canal is formed. Let any one take two slips of paper of the same length, and cut two small holes in the centre of each. Let him then lay these holes opposite each other, and pass through them a quill or pencil case. When he has done this, he has a very good plan of the state of the parts about the groin in the foetus. If he now holds the papers opposite him, and then pulls to one side the one nearest to him, he will find that by so doing he comes to lay the quill between the pieces of paper in the same way that the spermatic cord, by the extension upward and outward of the internal orifice of the ring, comes to be lodged in the long canal. He will also see that the length of the canal must vary according to the greater or less extension of its posterior side. On pages 56 and 69 of this present work it will be seen that the author has expressly stated that the inguinal and femoral canals are not properly canals unless distended by a hernia. In a normal state they are simply flattened passages.

It is this close apposition of the tissues that first led the author to consider the feasibility of producing union of all these parts by exciting a certain amount of inflammation and the exudation of plastic lymph. If we bear in mind this anatomical relation, we can readily see the practicability and propriety of the operation of injecting into these parts some stimulating fluid which may excite and bring about this desired object. The careful anatomist sees that in proportion to the degree in which the posterior side of the canal overlaps the anterior, so must the length of the canal vary. He will thus understand why inguinal hernia is much more frequent in young than in old subjects, why it is often cured spontaneously in the former and seldom in the latter, and why in the one it is a more dangerous affliction than in the other.

In the advanced stage of hernia, the parts are brought into precisely the same state they were in when the disease began. In a congenital hernia, or in the common inguinal hernia taking place in a very young child, the sac passes through a mere aperture; then we see that in time, owing to changes which this opening undergoes, the gut is lodged in a canal, so-called. This continues until the tumor becomes large, when the posterior side of the canal, owing to the pressure, is slowly absorbed, and again the upper and lower orifices are brought opposite to each other, so that the hernia resembles, in its appearance and course, the incipient tumor. If this view of the anatomy be a correct one, we see that by preventing the descent of the intestines, and by returning the sac, we bid fair to cure the disease by allowing the extension of the posterior side of the canal along the cord to take place.

In the very young child, there is no security against hernia, except what arises from the cord filling the aperture through which it passes. This is generally sufficient, for the infant is exposed to few of the exciting causes of the disease. In later

life, nature has wisely provided that, in proportion to the danger, the security should be increased. The posterior side of the canal overlaps, every day more and more, the anterior side ; consequently, when the canal is completed, any pressure against the posterior side, tending to produce hernia, has the effect of laying that side more firmly in contact with the cord, and of forcing the latter steadily against the anterior side, where the fibres of the transversalis and internal oblique muscles react upon it. Thus a most perfect valve is formed, and, when the posterior side of the canal is fully extended, it is impossible that inguinal hernia can take place except by violence. When hernia has once taken place, the very objects which formerly had a tendency to prevent the descent of the intestines are now so far changed in their action that they present obstacles to their replacement.

In the *congenital* form of hernia, the sac is formed of that portion of the peritoneum formed by the descent of the testicle. The passage of the testis through the inguinal canal usually takes place about the eighth month of intra-uterine life. Under conditions retarding the rate of development, this transit may be delayed until after birth, and may be observed to occur at any period during the first few years.

Cases are not uncommon in which this descent is retarded until the period of puberty has passed. In such instances, the gland is almost always retained permanently within the abdomen by adhesions to the colon or parietes, and is usually more or less atrophied. (See page 15.) Sometimes it is arrested in the inguinal canal itself, and is not infrequently mistaken for a hernia. The differential diagnosis may be found in the table on page 81. The impulse given to the gland, upon coughing under these circumstances, results from the presence of a portion of intestinal omentum in a *cul-de-sac* of the peritoneum, arrested in its developments into the tunica vaginalis in the male, and into the canal of Nuck in the female.

Certain writers have supposed that the gubernaculum testis possesses the power and has the function of drawing down the testis through the inguinal canal. This gubernaculum attains its full development between the fifth and sixth months; it is a conical-shaped cord attached, above to the lower end of the epididymis, and below to the lower portion of the scrotum. It is placed behind the peritoneum, lying upon the front of the psoas muscle, and completely fills the inguinal canal.

According to Mr. Curling, in his "Practical Treatise on the Diseases of the Testis," the gubernaculum, as well as the muscular fibres of the cremaster which surround it, divides below into three processes. The external and broadest process is connected with Poupart's ligament in the inguinal canal, the middle process descends along the inguinal canal to the bottom of the scrotum, where it joins the dartos, the internal one is firmly attached to the os pubis and sheath of the rectus muscle. Up to the fifth month the testis is situated in the lumbar region, covered in front and at the sides by peritoneum, and supported by a fold of that membrane called the *mesorchium*. Between the fifth and sixth months, the testis descends into the iliac fossa, the gubernaculum at the same time becoming shortened. During the seventh month, it enters the internal abdominal ring, a small pouch of peritoneum (processus vaginalis) preceding the testis in its course through the canal. By the end of the eighth month, the testis has descended into the scrotum, carrying down with it a lengthened pouch of peritoneum. Just before birth, the upper part of the pouch usually becomes closed, shutting it off from the peritoneal cavity.

Mr. Curling believes that the descent of the testis is effected by means of the muscular fibres of the gubernaculum; those fibres which proceed from Poupart's ligament and from the obliquus internus are said to guide the organ into the inguinal canal, those attached to the pubis draw it below the external

abdominal ring, and those attached to the bottom of the scrotum complete its descent.

Although there can be but little doubt that the main cause of the formation of congenital hernia consists in the retardation and want of vigor of developmental changes, which seal up the inguinal rings and the canal after the testis has accomplished its transit, still there is great doubt that the descent of the testis above described is accomplished by the forcible retraction of the muscular fibres of the gubernaculum. More probably, the descent is by a simple growth taking place in different parts and in different directions at successive periods of fœtal life.

The gubernaculum in the human subject, therefore, has no proper function as an organ, but is merely the anatomical vestige or analogue of a corresponding muscle in certain of the lower animals, where it has really an important function to perform. In the rabbit, for instance, the serous pouch of peritoneum, which preceded the descent of the testis, remains in communication with the peritoneal cavity even into adult life, so that the testis may be alternately drawn downward into the scrotum or retracted into the abdomen by the action of the gubernaculum and the cremaster muscle.

Guthrie believes that the testis ascends or descends, as the case may be, at the proper period, for the same reason that a child is usually born at nine months in preference to any other period of uterine gestation, which is, as Avicenna says, by the will of God. The office of the gubernaculum appears to be therefore rather to keep a passage open, which might, if it were not occupied in this manner, be closed, than to operate upon the testis by any contraction of its substance. This view is still further strengthened by the anatomical fact, mentioned even by Curling, that the gubernaculum diminishes in size as the testis approaches the bottom of the scrotum. This diminution is not, however, in the muscular fibres, as we might suppose it would

be if their function had ceased, but is owing to a change in the disposition of the cellular elements of the structure.

As the testis passes through the transversalis muscle, it may carry down with it any fibres which lie in its way; when this occurs, the transversalis is found to be united at this part to the internal oblique. The fibres thus brought down assist in the formation of the cremaster muscle, which is nothing more than a certain portion of the lower edge of the internal oblique, caught by the testis and carried before it, curling to the contrary notwithstanding. See page 61. When the testis is retained in the abdomen, it is not because of a lack of an opening in the transversalis or internal oblique muscles, but for some reason which has not yet been sufficiently explained, as the person usually suffers from a hernial protrusion because the parts are less defended than usual by the natural structures.

If at the period of birth the testis has but just escaped from the canal, or still lies lodged above the external ring, the cries and struggles of the infant, during its first inspiratory movements, will force down a portion of the intestines into the canal. The continual recurrence of this protrusion will prevent the proper closure of the openings. As a rule, the later the descent of the testis through the rings, the larger and the less disposed to close is the hernial opening which results. In many individuals not ruptured in childhood, a late descent of the gland leaves a patulous condition of the external ring which greatly predisposes to the subsequent formation of a hernia; since the only resistance in such cases is a limited extent of adhesion at the upper part of the canal and internal ring. It is generally associated also with a feebleness and deficiency of the lower fibres of the internal oblique.

I have at present, under my professional care, a patient neither of whose testes has ever descended. He is a physician fifty years of age, and the father of four children. He has

double inguinal congenital hernia, oblique on the right side, and direct on the left. The former descends into the scrotum, lying beneath and back of the testis, which can be felt in the external ring. The condition is the same on the left side, except that the hernia does not descend into the scrotum. The rings upon both sides are enormously enlarged. It is remarkable in this case that the testes will endure without pain pressure sufficient to allow a double truss to sustain the herniæ, and that they can also be freely handled. When, however, the patient is amorous and excited, the truss causes such extreme pain and almost faintness that, on account of the exhaustion, he has to abstain from such exciting influences.

A similar formative deficiency in some of these cases may possibly account also for the non-descent of the testis. The peritoneum is usually lax and loose, and plentifully bestowed upon the superior false ligament of the bladder, which rises more than usual out of the pelvis when distended, and is broader in proportion to its depth. Upon dissection it is usually found that the peritoneum is thinned to its utmost extent by the gradual filling up and dilatation of its areolar meshes by a deposit of fat. In the omentum particularly, it may be entirely perforated in many places so as to assume a cribriform appearance. In these cases the fat, which is the more temporary tissue, may have been more quickly absorbed by illness or starvation than the containing tissues are able to contract and follow it. The inguinal and other hernial openings are left patulous, and the weakened and yielding peritoneum quickly contributes a thin sac to the rapidly forming hernia which results.

It follows from this description that congenital hernia must necessarily be of the oblique variety, in its relation to the internal ring and epigastric artery, and that a true direct hernia is rarely seen in the child.

The student who bears in mind what has been previously said

in regard to the inguinal canal, and the relative position of the rings to each other in the foetus and young child, will not by this statement be misled into the idea that congenital hernia in the child takes such an oblique course as external or oblique hernia in the adult. He will, however, readily see the viciousness of the term "oblique inguinal" hernia, the confusion and misunderstanding caused by it, and the worse than confusion caused by the misnomer "indirect," as sometimes applied to the same variety. In long-continued and neglected cases, as I have further emphasized on pages 7, 73, and 180, the internal and external openings are often closely applied to each other and the oblique hernia becomes in its treatment and the difficulty of its management like a direct hernia.

In early foetal life, and in many cases for a month or so after birth, the tubular process of the peritoneum, which I have spoken of, extends into the scrotum, lying in front of the spermatic cord and testis and extending from the internal inguinal ring to the lowest end of that gland. Before birth or soon after, this vaginal process of the peritoneum becomes divided into two portions, — the superior or *funicular* process, and the inferior or *vaginal* process. Under normal conditions the inferior, or vaginal process peculiar to the testis, remains throughout life as a closed serous sac, and the superior canal or vaginal covering peculiar to the spermatic cord, the funicular process, is entirely obliterated, and its superior abdominal orifice permanently closed.

The time at which the closure of this ventral orifice takes place and the obliteration of the canal is completed is not fully determined. The *first* stage in the obliteration begins at the upper part from the internal inguinal ring, at least on one side. The *second* stage is marked by a union of the walls of the vaginal sheath as far as the superior end of the testis. The *third* stage is accomplished when the canal is entirely or partially closed, and when the serous membrane is converted into connective

tissue. In the *fourth* stage, this strip of connective tissue becomes thinner and at last disappears.

In the majority of new-born infants, some portion of this vaginal canal still remains. In twenty-one cases, Seiler found four in which it was open on both sides, five in which it was open on the right side, and four on the left. In fifty-three new-born infants, Camper found twenty-three open on both sides, eleven on the right, and six on the left. Schreger found in thirteen infants that the canal was open in eight on both sides. Paletta gives the rule, that the complete closure of the vaginal canal takes place from the twentieth to the thirtieth day after birth.

Hernia into the Vaginal Process of the Peritoneum.—When the intestines escape into this open canal, the hernia of infancy exists, and the serous sheath is converted into a hernial sac. Haller, in 1749, was the first to call the attention of pathologists to this fact. John Hunter and Percival Pott confirmed his observations. Haller called the variety in which the intestines and testis touch each other, or are contained in the same sac, a “congenital hernia,” which name is still applied to it. Birkett, however, considers the term inappropriate, since “the hernia does not exist either during intra-uterine life or at birth.” As, however, a congenital malformation allows the descent of a hernia soon after birth, Malgaigne calls it the “*hernia of infancy*.” Birkett still, however, prefers the term, “*hernia into the vaginal process of the peritoneum*.” See Fig. 10. Other illustrations of the same abdominal imperfection may be found in Camper’s “*Icones Herniarum*,” John Hunter’s “*Med. Comm.*,” and in Palmer’s edition of the “*Works of J. Hunter*.”

Pott wrote nearly a hundred years ago that “ruptures of this kind are said to be very rare, but from what I have observed both in the living and the dead I am inclined to believe that they happen much oftener to adults than they are suspected to;” while Scarpa says, “It is impossible to turn the bottom of the

hernial sac upwards in congenital hernia, as may be done in common hernia, leaving the spermatic vessels with the testicle in their situation; for it is not possible in congenital hernia to raise and invert the bottom of the vaginal coat forming the hernial sac without raising at the same time and turning upwards the testicle and spermatic vessels which are inserted into it. Upon which point I cannot mention but with horror the injury which, from a want of this knowledge, was practised on the celebrated physician Zimmermann, from the false persuasion under which the surgeon labored, of being able to raise up the bottom of the vaginal coat without removing the spermatic vessels from their situation, and to tie it at its neck in order to prevent the return of the hernia, according to an erroneous and already antiquated opinion."

It is probable, according to Scarpa, that the descent of the cæcum into the scrotum sometimes takes place in preference to that of the small intestine. This may arise from an excessive laxity of the union of the cæcum with the peritoneum, and a weakness of the aponeurosis of the external oblique. If the hernia be *congenital*, it was probably occasioned by the adhesion of the testis to the cæcum before the descent of the former into the scrotum. Wrisberg has several times demonstrated a fascia binding the testis partly to the mesentery of the vermiform appendix, partly to the cæcum, and partly to the ileum.

Hernia into the Funicular Portion of the Vaginal Process. — When an annular constriction of the walls of this vaginal process takes place between the external abdominal ring and the testis, the hernia lies in the superior portion before spoken of, and is called "*hernia into the funicular portion of the vaginal process.*" (See Figs. 11 and 12.) Instances of this constricted condition of the sac of an oblique hernia are recorded by Pott, Wrisberg, Le Cat, Scarpa, Pelletan, Sir Astley Cooper, and Lawrence.

Acquired Congenital Form. — The “*acquired congenital form of hernia*,” “*encysted hernia of Sir Astley Cooper*,” or the “*infantile hernia of Hey*” (see Fig. 13) are synonymous terms for a variety of oblique hernia which also depends upon an abnormal state of this vaginal process. In this variety the ventral orifice of the sheath is closed, but the canal persists from that point to the testis. The parietal peritoneum is slowly pushed into this sheath, so that, as Hey says, “the tunica vaginalis is continued up to the abdominal ring and encloses the hernial sac.” From its name, one might infer that this hernia is always developed in infancy; such, however, is not the fact. Hey’s case was an infant fifteen months old, and Cooper’s case was about thirty-one years old. The variety is very rare.

Acquired Hernial Sac. — The more common form of hernia is where the viscera have been protruded into the acquired hernial sac, which is, however, distinct from the testis or closed vaginal process of peritoneum. (Fig. 14.) Pott believed that “common ruptures, or those in a common sac, are generally gradually formed; that is, they are first inguinal and by degrees become scrotal; but the congenital are seldom if ever remembered by the patient to have been in the groin only.” The great importance of a knowledge of the anatomical differences between these two kinds of hernial sacs is especially demonstrated in their surgical treatment.

Birkett says: “When the surgeons of the last century discovered that a hernia could pass into the vaginal process of the peritoneum and there be in contact with the testicle, they appear to have been content, and without further research to have assumed this variety to be the only form of hernia dependent for its origin upon non-closure of the ventral orifice of this canal or upon defective obliteration of the upper part of the vaginal process of the peritoneum.”

We now know that the testis may be wholly shut off from

every protruding viscus, but that there may yet remain the upper portion of the vaginal process in open communication with the abdomen at the internal ring. Into this cæcal or funicular portion of the process, a hernia may protrude and be quite as much congenital as the variety ordinarily characterized by that term. Malgaigne was the first surgeon to point out this variety, its origin and its anatomical relations. There may be two explanations of its occurrence; either the parietal peritoneum was suddenly pushed down, or else the serous canal existed continuous with the peritoneal cavity. The latter seems to be the more correct view.

In this connection I beg leave to insert, as one of the most recent theories of the causation of hernia, the following essay by Samuel Osborn, F.R.C.S., upon "Phimosis as a cause of hernia in infants":—

"Having, in my capacity as surgeon to the Surgical Appliance Society, to examine many cases of hernia and apply some hundreds of trusses in the course of the year, the frequency of phimosis in combination with rupture in infants has struck me repeatedly. More especially of late, as I have had no less than ten cases within the last month. The phimosis in all these cases, I am certain, was the undoubted cause of the rupture, and may be thus explained.

"After the descent of the testicle into the scrotum has been accomplished, the vaginal process of peritoneum, through which it descended, begins to close and become converted into a fibro-cellular cord. But the testicles having but lately descended (the left coming down between the seventh and eighth months of foetal life, and the right between the eighth and ninth months) the uniting medium is but yet young; and, not being sufficiently organized, is easily broken down by any strain thrown upon it.

"Phimosis occasions that strain from the impediment which it offers to the outflow of urine; for the mechanism of ordinary

micturition is effected by the contraction of the muscular coats of the bladder and urethra; but in cases of obstruction to the outflow of the urine, extraordinary force is called into action, and this is effected by the contraction of the abdominal walls pressing upon the bladder, whilst the diaphragm is also, at the same time, in a state of tension. By this means pressure is exerted over the whole of the abdominal wall; and the apertures by which the testicles have descended to the scrotum being always the weakest points of the abdominal surface, they naturally give way under the strain thrown upon them. In other words, the child, straining to pass his urine, forces the abdominal contents downwards upon the weak points at the inguinal canals, and rupture on one or both sides results.

“I would go even still further than this, and say that the canal which has been the last to close, or in other words, that side on which the testicle was the last to descend, is the side on which we usually have the rupture occurring; and knowing that the right testicle is generally the last to descend, we naturally find that hernia in infants is also most frequently observed on this side. That the rupture occurs on the side on which the testicle was the last to descend, is only what one would suppose; for the uniting medium, which is effecting a closure of the canal on this side, is not in so advanced a condition of organization as on the other side, where the testicle has taken its place prior to the other.

“It is thus easily seen how a single truss frequently produces a double rupture. The cause of the obstruction to the outflow of urine is still present in the phimosis; and, one inguinal canal being guarded by the single truss, the abdomen gives way at its next weakest point, namely, the other inguinal canal, and a double rupture is the consequence. Such a result might have been prevented by early circumcision. The hernia in these cases is generally scrotal, or, if not, it soon becomes so by the wedge-like

projection of the intestines ; and, whether it be congenital or infantile in variety, depends upon the amount of the funicular process of peritoneum which has become converted into fibro-cellular tissue, or which has been broken down by the aforesaid propulsion of intestine.

“The operation of circumcision as performed upon young children, and which was done in all of the cases of which I previously spoke, is both easy of performance and effective in its results ; easy of performance, because no sutures are ever required, children bear pain well, and the parts are usually well in a week or ten days ; it is effective in its results, because the hernia then stands every chance of being effectually cured by the application of a truss, the exciting cause having been removed ; and at all events a double rupture is prevented by its early adoption. Occasionally difficulty arises in the operation when the rupture is very large ; for the penis, buried by the projection of the rupture, is represented in such cases by a button-hole aperture, and the operation is then more easily effected if the rupture be commanded by a double inguinal truss during its performance. In conclusion, I would suggest that, whenever an elongated or contracted prepuce is present in infants, the sooner circumcision is performed the better ; thereby the more serious complaint of rupture would be prevented.”

Umbilical Hernia. — Umbilical hernia, properly so called, is a disease of infancy. It rarely occurs in the adult, and whenever it does occur we may say either that the beginning of the disease had passed unobserved in infancy or else that it had occurred in the linea alba either above or below the aponeurotic umbilical ring or on one or the other side of it ; rarely, as is shown on page 39, through the ring.

It is not until the fourth month of foetal life that the abdominal muscles assume a fibrous form from the umbilicus to the pubes ; but the centre of their union in the linea alba becomes

depressed and is the part of the aponeurosis that is least resistant to pressure. A small fossa like a funnel is formed in the umbilical ring on the side of the abdominal cavity by compressing the centre of the umbilicus with the point of the finger and at the same time drawing the cord gently outwards. Two months after the cicatrization of the umbilicus, this fossa is no longer presented; but, on the other hand, a small tubercle which resists pressure and to which the peritoneum very firmly adheres.

In process of time the cicatrix of the integuments deepens and comes in contact with the aponeurotic umbilical ring, which is likewise plugged in the centre by the three umbilical ligaments and by the urachus; "these ligaments form a triangle, the apex of which is fixed in the cicatrix of the integument, the base in the liver, in the two ilio lumbar regions and in the fundus of the bladder." This triangle acts as an elastic bridle to prevent the viscera from protruding through the ring. The margin of the ring also is thickened and elastic. From all these circumstances, it is easy to see that the danger of the formation of umbilical hernia diminishes as the fœtus approaches maturity and as the infant increases in age; unless, indeed, external conditions interfere.

This variety of hernia, like all other varieties, may be either *Congenital* or *Adventitious*. The congenital form is found in the embryo, in the immature fœtus, and in the fœtus at full term. (See page 49.) The hernial sac contains sometimes a knuckle of small intestine, sometimes a prominence formed by the liver, and sometimes even the spleen or portion of the large intestine. Fœtuses born with this disease survive in general only a short time, both because they are affected with spina bifida and other abnormalities and because the viscera protruded have formed adhesions and cannot be completely reduced. The principal cause of this congenital disease is probably owing to the slow

and incomplete development and closure of the abdominal muscles. (See Fig. I).¹

Besides the intestine, there is a very well authenticated case by Cabrolus that even the urinary bladder, when there has been an obstruction to the outflow of the urine, has been raised so high in the abdomen as to form a hernia through

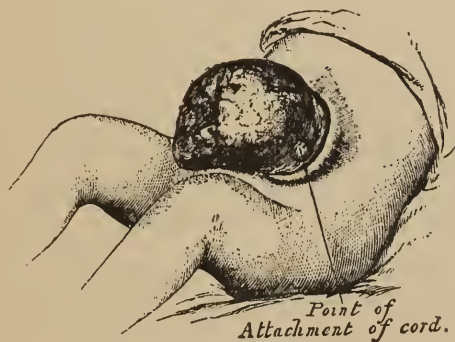


FIG. I. — Congenital Umbilical Hernia.

the umbilical ring and afterward to open externally in a urinary fistula. The urethra was closed by a membrane. The girl having reached the age of eighteen, the umbilicus protruding about four inches, an incision was made into the membrane, the urine took its natural course, the fistula closed and the tumor disappeared. Probably the protruded viscus had no peritoneal covering.

A similar case occurred in a lady patient of mine from Deer Isle, Maine, in 1878. From her umbilical hernia she menstruated and micturated. The treatment was to dilate the urethra and the os uteri, both of which seemed to be spasmodically closed as if by a stricture. Menstruation from the fistulous opening in the hernia had followed the birth of a child; previous to that time urine and pus only had been discharged. After six months' treatment, the urine and menses resumed their natural course; the fistulous opening was nearly closed by gran-

¹ See *Rare Forms of Umbilical Hernia in the Fetus*, by James R. Chadwick. Reprint from Vol. I. *Gynecological Transactions*. Boston, 1876.

ulation, but the hernia still remained. It should be stated that I was able repeatedly to pass an ordinary uterine probe through the fistula into either the uterus or bladder. Closure was brought about by the application of perchloride of mercury on the end of the probe.

Adventitious umbilical hernia in children is the result of the combination of several unfavorable circumstances. First, we may mention as a cause, the slowness of the contraction of the aponeurotic umbilical ring; difficult labor; the weak cohesion of the divided extremities of the vessels of the cord with the cicatrix of the umbilicus and the aponeurotic margin of the ring, together with the weakness of the integuments composing the umbilical cicatrix; and the permanent tumescence of the abdomen for some time after birth. When these circumstances exist, the continual cries and struggles of the infant are sufficient to protrude the viscera from the umbilicus as the weakest part of the abdomen.

The division of umbilical hernia into the *true umbilical* and into the *hernia of the linea alba* is not without its value. The latter increases more slowly than the former, and is more likely from its smallness to pass unobserved, especially in very fat persons. It is more common above than below the umbilicus, because, as Scarpa thinks, the linea alba from the ensiform cartilage to the umbilicus is naturally broader and less resistant than from the umbilicus to the pubes, since the recti muscles as they descend constantly converge towards each other. The treatment also is more difficult and less satisfactory than in true umbilical hernia, probably because the aponeurotic ring has a natural tendency to contract, while contraction is not easily obtained in the fissure in the weakened aponeuroses forming the linea alba.

Hernia in the Adult. — Having considered the formation of hernia in foetal life, we will next consider some of the causes of

hernia in more adult life. Three theories have been offered to account for this complaint ; and as the adoption of one or the other of them may influence our judgment as to the curability of the disease, we will briefly notice them. First ; the theory which has received the support of Warton, Morgagni, Brendel, Richter, Benevoli, Rossius, and which is now held by some surgeons, is that the immediate cause, especially of inguinal hernia, is an abnormal elongation of the mesentery permitting such movement of the bowels as to allow their protrusion through the openings in the groin under abnormal circumstances. The assumption is that a mesentery of proper length would not allow any protrusion of the intestines through an opening in the abdominal wall.

Without recapitulating the arguments opposed to this opinion from the able hands of Scarpa (*Traité pratique des Hernies*) and of Samuel Cooper (*Surg. Dict.*), some facts may be mentioned which any anatomist may observe, and which tend to support the conclusion of the first-named surgeon, that the necessary elongation of the mesentery does not precede the displacement of the intestine, but is more probably simultaneous with it, and that both the elongation and the displacement are dependent upon a common cause.

When the bowels are distended with food or air the whole front wall of the abdomen is projected forward. There being no vacuum and action and reaction being equal, the pressure is equally distributed over the whole of the containing parietes. The mesentery is stretched to its utmost. If the sides be sound and equally resisting, the whole of the abdominal wall yields equally to the pressure and no hernia occurs ; but, if one part be weak while another is resisting, that part yields to the pressure and a hernia results. The culminating point of the pressure is produced by the action of the recti and other abdominal muscles antagonizing the downward pressure of the abdomen and the

inspiratory action of the lungs. The most likely, as well as the most frequent place for the abdominal walls to yield before such pressure, is in the aponeurotic structures at the side of the recti muscles, especially when the internal abdominal ring is not sufficiently strong.

Often, however, the umbilical opening, which is nearer the point of attachment of the mesentery than the openings in the groin, yields, and this is especially the case in children. In other cases the obturator foramen, the vagina, or the sciatic notch are found to be the weak parts, although they are much further removed than the groin from the root of the mesentery. These facts lead to the induction that the hernia is dependent rather upon the weakened abdominal parietes than upon an elongated mesentery.

There is, moreover, a great variety in the position of the attachment of the mesentery to the spine. It is thus very common to find a great part of the small intestines lying in the cavity of the true pelvis between the bladder and rectum. The same result may also be brought about by hypertrophy of the liver, stomach, or spleen; yet hernia is by no means the necessary or frequent accompaniment of these conditions, because the abdominal walls may be everywhere equally resistant and strong enough to retain the viscera. If then the mesentery be long enough to allow the small intestines to lie in the true pelvis, it is surely long enough to allow them to protrude at the groin if the parietes be weak.

Again, the direction of the mesentery is toward the left side of the abdominal cavity, and the small intestines lie chiefly in the left lumbar, iliac, and hypogastric regions. If the supposition in question were true, hernia should be more common on the left than on the right side, whereas precisely the opposite is the case (see page 47).

But perhaps the most conclusive argument is to be drawn

from the fact that we find hernia most common, not in subjects who have elongated mesenteries, but in those in whom the abdominal parietes are deficient or insufficient, and that it is an indisputable fact that herniæ have been cured by strengthening these containing parietes. If hernia were primarily and principally due to an abnormal elongation of the mesentery, any attempt to cure it, by occluding the opening and strengthening the wall, must be either useless or result in a protrusion in some other weakened part.

Second;—the theory that the chief cause of a hernial protrusion is to be found in a deficiency in some part of the walls containing the intestines. What the precise structure of the retaining power is, is a matter upon which there is a difference of opinion. Some suppose that the parietal peritoneal layer is the most powerful agent in retaining the intestines. At the internal abdominal ring there are evident traces of a cicatrix closing the vaginal process and the canal of Nuck. This must evidently offer considerable resistance to a protrusion. The sense of something giving way, which is often one of the first experiences in the occurrence of a hernia, is probably due to the yielding of this resistance, together with the forcible dilatation of the internal ring.

Although weakness and laxity of the peritoneum, together with a general laxity in the abdominal muscles, may predispose to the formation of a hernia, yet it can hardly be maintained that this is the chief cause of hernia, since hernia frequently occurs where no such laxity exists.

The chief cause of rupture, according to this theory, consists in the inefficiency of the tendinous or muscular walls to resist pressure from within. The cause of inguinal hernia lies in the failure of the valvular action of the walls of the canal, as we have previously shown; of femoral, in the inefficiency of the cribriform fascia, which is protruded to form the fascia propria of the hernia.

Third; — the theory that the causation of hernia is to be found in an increased pressure caused by the viscera. This increased pressure may be termed the *exciting* cause, while the diminished resistance of the abdominal walls is the *predisposing* cause of hernia. The action of the respiratory muscles is the principal source of pressure upon the viscera. The diaphragm, by its contraction, pushes the contents of the abdomen against the relaxed abdominal walls; these subsequently contract and push the viscera against the relaxed diaphragm.

When these movements of diaphragm and abdominal muscles are alternate, the viscera can easily sustain the pressure and compression. When, however, these same muscles act simultaneously, as during the forcible expulsion of the contents of the uterus, rectum, or bladder, or when they are firmly fixed to enable the person to perform any great exertion, the viscera sustain a much greater compression, and consequently react much more violently upon the abdominal muscles. The strength of the walls, and the pressure of the viscera are so admirably adapted to each other in their normal state, that, with ordinary respiration and with the ordinary contraction of the abdominal muscles, the viscera do not protrude. When, however, the walls are abnormally weakened or the action of the muscles excessive, the resisting power of the former is often overcome, and a hernia is produced. When the viscera are once displaced, if the weakest point of the abdominal walls is at the groin, their further displacement is very rapid, owing both to gravity and the action of the diaphragm and abdominal muscles.

The *predisposing* causes of hernia are of three kinds: — First: Whatever tends to diminish the resistance of the abdominal walls, such as a weakened constitution, laxity of the fibrous tissues, congenital enlargement of the canal, ascites, pregnancy, old age, etc. Poverty and hard work thus favor the production of hernia. Men, who have larger abdominal rings than women,

are the more liable to inguinal hernia ; while women who have a deeper and wider femoral arch than men, and usually smaller muscles over the space, are relatively more subject to femoral hernia.

Second : Whatever increases the volume, weight, or mobility of the contained parts ; such as hypertrophy of the viscera from whatever cause, deposition of fat in the omentum, etc.

Third : The existence at birth, and persistence, afterward, of a canal composed of a prolongation of the peritoneum. This has already been considered on page 13 under congenital hernia.

The *exciting* causes of hernia are : — First : Wounds or lacerations of the abdominal walls. Second : The weakening or destruction of the same parts by inflammation. Deep-seated abscesses about the hip-joint, groin, and perinæum, may also undermine and weaken their adjacent tissues. The ætiology of ischiatic and pudendal hernia, together with some other varieties, will thus be easily understood. Third : Whatever diminishes the capacity of the abdominal cavity, the viscera remaining of their normal size. Under this head may be included the tight lacing of corsets, the wearing of tight pantaloons or a strap around the waist, as is the custom among many laborers. Fourth : The gradual expulsion of the parietal peritoneal membrane at weak parts of the abdominal walls. This protrusion is produced by whatever calls into play the violent simultaneous action of the diaphragm and the abdominal muscles.

This action, which constitutes the act of straining, plays an important part in the production of hernia, even when the containing parietes possess their usual strength. It is most strikingly exemplified in lifting heavy weights, leaping, singing, especially in deep tones, and in playing on wind instruments ; in the powerful and irregular acts of excessive coition, vomiting, coughing, horseback riding, and some military exercises ; in certain diseases, as calculus, constipation, asthma ; in exces-

sive exertions immediately after a full meal, or during the state of pregnancy, in the exertions attending difficult parturition, and in the forcible attempts to evacuate the rectum or bladder made by persons afflicted with stricture, enlarged prostrate, stone in the bladder, and constipation.

Straining is also produced by hæmorrhoids, or piles, by fissures of the anus, and by fistula in ano.* Spondylitis, and curvature of the spine from whatever cause, may also produce a protrusion of viscera at weak or weakened portions of the abdominal parietes. Hernia may however be produced, not only by these diseases themselves, but also by the very methods of their treatment. Prof. John T. Hodgen, of St. Louis, recognizing this fact, criticised, at the Richmond meeting of the American Medical Association, the plaster casts applied by Dr. Lewis A. Sayre for curvature of the spine. He believes that they "have a tendency to cause hernia and deprecates their use in such cases."¹ Certain concussions, for example, those from railroad accidents and collisions, will also be found to be a fruitful source of hernia.

In this connection, the essay upon phimosis as a cause of hernia in infants, on page 17, will be interesting for the reader to peruse again. Generally, several causes act concurrently in the production of hernia. Some authors have gone so far as to assert that a hernia cannot be produced in a person who is not predisposed to it. This would seem to merit some consideration, when we reflect upon the cases cited by different authors and met in our own practice, where a hernia, being retained, was followed by a second, and sometimes by even a third or fourth, in other weakened parts.

Consistently, however, to support the opinion that exertion is the most frequent cause of hernia, it must be shown that exertion is the primary as well as the proximate cause. If a person during some extraordinary exertion suddenly experienced great

¹ See p. 266.

pain in the groin, and was sensible that something unusual had occurred; if on examination a protrusion of the viscera was found, but the parietes in a firm state and the ring so constricting the protrusion as to occasion some difficulty in replacing the tumor; and if, when replaced, it did not again immediately protrude, a fair argument would be that up to the time of the accident there was no predisposition to hernia, but that overexertion was the sole cause.

On the contrary, suppose a person sensible of a hernia during great exertion, but the parts found to be in a relaxed state, the protrusion, not constricted by the ring but readily reducible, and when reduced disposed to reprotrude immediately, — in fact the resistance of the parietes diminished; how can it be ascertained whether in such a case exertion or predisposition was the remote cause?

That extraordinary exertion is often a cause of hernia, no one who has had any experience with the complaint can doubt, and that it will facilitate the descent of the viscera, when a predisposition exists, is also certain. Still, it is a well-known fact that indolence and sedentary habits encourage such a predisposition, and I do firmly believe that if an impartial investigation were made, the complaint would be found quite as common among those who lead sedentary lives as among those of more active habits. Persons of sedentary habits are not only more liable to the predisposing causes in a greater degree, but they are also equally liable to many of the exciting causes.

The wear and tear of a working man's constitution is often erroneously attributed to the quantity of exertion employed in gaining a subsistence. A little inquiry and observation will correct this notion and enable us to find other and much more probable causes, among which intemperance stands pre-eminent. The frequent draughts of ale and beer, to say nothing of stronger liquors, to which most working men are accustomed, are of

themselves sufficient to account for most of their ailments. Those men whose work is what is termed heavy find a ready excuse for such indulgences; they foolishly imagine, or pretend to imagine, that all these potations are necessary to support their strength, while the artificial thirst thus created by habit is, they contend, the call of nature. The natural vitality of the body, which is so powerful an auxiliary to the vis medicatrix, is therefore turned to no other account than partially to resist the effects of this inseparable intimacy between the cup and the mouth.

The thousands who are employed in manufactories, some exposed to fever temperature, some to the noxious effects of impure air, some to unwholesome employments, some only half fed, and almost all packed into rooms ill-ventilated, and living in the same unhealthy manner, furnish abundant evidence of causes for debility without referring to excessive labor. An eminent physician has said that ere long cases of hernia would become comparatively rare because machinery would be universally substituted for manual labor. We know that within the past fifty years machinery has been most extensively introduced, and therefore less manual labor required; yet hernia has not become less frequent, but on the contrary much more frequent. This is shown by the extraordinarily increased demand for trusses, according to the statistics given by various truss societies and manufacturers.

Lawrence has said that our inferiority in muscular development arises, not from organic deficiency, but from want of exercise. Civilized man is ignorant of his own powers. He is not sensible how much he is weakened by effeminacy, nor to what extent he might recover his native powers by the habitual and vigorous exercise of his frame. Labor braces muscular fibre by promoting full circulation and healthy perspiration. It is true that labor carried to excess produces fatigue; but rest

and conservative power restore strength again, and it is reasonable to suppose that this restorative power is not denied to the parts in the neighborhood of herniæ. The amount of exertion necessary to cause fatigue must, of course, depend upon habit and constitution, but, at all events, it is quite certain that the less we exercise ourselves, the sooner we are fatigued.

“The first physicians by debauch were made ;
Excess began, and sloth sustains the trade :
By chase our long-lived fathers earned their food,
Toil strung the nerves and purified the blood,
But we, their sons, a pamper'd race of men,
Are dwindled down to three score years and ten ;
Better to hunt in fields for health unbought,
Than fee the doctor for a nauseous draught ;
The wise for cure on exercise depend —
God never made his work for man to mend.”

DRYDEN.

If then sedentary habits occasion great relaxation, the parts in the groin will necessarily become more flaccid, and we may expect to find the rings larger, their margins weakened, and, in all probability, an abnormal laxity of the peritoneum. Such a condition of the parts is a positive predisposition to hernia, and it requires only some exciting cause, to which all are liable, to force the viscera out of the abdomen. On the contrary, if the result of exertion shall be strength of muscle and tension of fibre, the parts in the groin will be capable of offering considerable resistance ; supposing, of course, no malformation to exist.

“In the development of inguinal hernia,” says Wood, “there are at least three different conditions of individual peculiarities.” In *one* class of cases, the muscular system is well developed. The cremaster is powerful, the hips are narrow, the inguinal canal and Poupart’s ligament short, and the genital organs small. The hernia is frequently direct, sometimes separating the fibres of the outer pillar. The sac is small in diameter, but when

scrotal, much elongated and with a flask-shaped neck; the fundus is apt to become pyriform and, if irreducible, to simulate a hydrocele.

The subjects of such herniæ are able-bodied men, soldiers, sailors, or laborers. Their hernia occurs suddenly with a sense of something giving way, and is often accompanied with pain and sickness. These cases are liable to that violent form of strangulation which depends upon a spasmodic contraction of the internal oblique across the neck of the sac.

The *second* class of cases has a greater development of the fibrous and fascial structures, with less development and power of muscle. Such persons are wiry and sinewy, so called, and often have a loose and shambling gait. The pelvis is large and the inguinal canal and Poupart's ligament consequently long. The muscular portions of the abdominal muscles are small in proportion to the extent and thickness of their aponeuroses. The total effect of this arrangement of the muscles and aponeuroses is to depress the abdomen in the median line and to produce extensive projections towards the iliac wings.

The genitals are usually large and loose, with a pendulous scrotum indicating an abundance of fasciæ and a feeble development of the muscular fibres of the dartos. The tendons are thick but inelastic, and apt to be weakened by rheumatic changes or fatty degeneration, especially after middle life. The pillars of the external ring are thick, but lose themselves in the thick coverings of the hernial sac, so that their edges are less evident to the touch. The hernia is usually of the oblique variety, and of slow formation. It is noticeable that a thick gristly ring is apt to form in the substance of the sac at its neck, while thickened bands of the deeper fascia may also cause a strangulation. This variety of hernia is a favorable one for the radical cure.

The *third* class of cases retains many of the foetal peculiarities,

and is generally of congenital or infantile origin, the viscera protruding from imperfect abdominal muscular development. The patient is usually fat, and the inguinal rings very patulous and capable of easy dilatation. The pillars of the external ring are small and thin, and are not so easily made out as in the former cases, being gradually lost in the coverings of the sac. They are weak and easily torn. The inguinal canal is short and wide; the internal ring large and its edges not easily distinguished. For a further description of them, see page 14.

Femoral Hernia.—A few special words upon this variety seem to be necessary. Before the age of twenty, this hernia is extremely rare. Sir Astley Cooper saw only three cases, aged seven, eleven, and nineteen respectively. M. Malgaigne, during five years of service at the Bureau Central, did not see a single case affected before the age of twenty. It is universally admitted to be more frequent in females than in males (page 44), and on the right than on the left side. There should, however, be one exception to this general statement. Malgaigne asserted that inguinal herniæ in females are the more numerous. He admits that femoral hernia is most frequently the subject of operation in women, but this, he says, proves only that femoral is more liable than inguinal to strangulation. See, however, page 43. He therefore established a more accurate method of diagnosis, which may be found on page 342.

The greater *predisposition* to femoral hernia in the female may be attributed to the fact that the muscles filling and covering the femoral arch are smaller in them than in men, and because the arch itself is wider and deeper from the wider expansion of the iliac wings. In the male, the arch, being smaller, is compactly filled by the psoas and iliacus muscles, and by the vessels and nerves passing to the thigh. It is also protected by the strong union of the transversalis and iliac fasciæ. The shrinkage of these muscles in advanced age leaves the femoral

arch less occupied, and when added to the general muscular and fibrous relaxation predisposes to the formation of femoral hernia. Hence is readily explained the greater frequency of this kind of hernia in old persons of both sexes.

The direction of the crural ring being very nearly upward and downward, the weight of the abdominal viscera, and the pressure exerted upon them by the abdominal muscles, combine in their effect to push upon the peritoneum and septum crurale which cover the ring above. When, therefore, the ring and canal are wide, as we have said they are in the female, the action of any exciting cause will tend to produce a femoral hernia. It will be found also that in those males who are the subjects of femoral hernia the pelvic wings are broad and spreading as in the female, and that, moreover, the muscular development is less than is normal to the sex.

Among the *exciting* causes of this variety of hernia may be included, not only all the exciting causes that we considered on page 27, such as lacerations, inflammations, compression of viscera, and straining, but also the more especial exciting causes, as dropsy, tumors, accumulation of peritoneal fat, the violent abdominal exertions attending child-birth, and the general relaxation of the abdominal walls after pregnancy.

The influence of pregnancy and child-birth upon the production of femoral hernia is so marked that it is rare to see this variety except in women who have borne children. In males, abdominal distention or accumulation of fat acts chiefly upon the inguinal rings, both because they are kept open by the spermatic cord and because the increased pressure acts upon Poupart's ligament from above. Femoral hernia has, however, been known to co-exist with inguinal. Malgaigne has noticed such a complication; Lawrence mentions a preparation in St. Bartholomew's Hospital, "exhibiting an oblique inguinal and a femoral hernia on each side in a male subject;" while Teale

cites a case of a patient admitted into the Leeds Infirmary "with two inguinal and two femoral herniæ."

The first occurrence of a femoral hernia is due to the yielding of the peritoneum, and to the loosening of its connections at the upper margin of the crural sheath. A pouch is then formed at the expense of the neighboring folds or false ligaments of the bladder. This then presses upon the thin septum crurale, until finally the cribriform fascia is stretched, the saphenous opening dilated, and the fundus of the tumor emerges under the integuments of the thigh. If these tissues be resistant, the hernia may remain for some time like a bubonocoele and cause no visible tumefaction, being concealed by Poupart's ligament and the fal-ciform process.

When, however, the integuments have yielded so that the hernia has protruded beyond the crural canal, the tumor gradually expands into a globular form, while the neck remains of nearly its original size; it has been known to extend half-way down the thigh. Serous cysts are occasionally developed in its vicinity, from the closure of the neck of an old hernial sac and from a new protrusion taking place by its side. For the differential diagnosis of femoral hernia, see Table No. 2, page 79, and also page 341.

EFFECTS OF HERNIA.

On the other hand, whatever be the individual physical peculiarities, we may naturally expect to see certain constant effects, when once there has formed a hernial protrusion. In a small and recent hernia that can be easily reduced, the protruded viscera seldom exhibit any change of structure; when, however, the hernia has attained great size, has long existed, and has become irreducible, they are frequently found congested, opaque, indurated, or hypertrophied. The coverings of the sac may also undergo pathological modifications (see page 74), while the

mesentery contained in the sac may be thickened, loaded with fat, and filled with congested and varicose vessels.

Under the distending influence of a protruded mass, the hernial apertures, which at first are somewhat oval, gradually become enlarged, and assume a more circular form. This enlargement is generally effected by the elongation and separation of the aponeurotic fibres composing the pillars of the rings. We have already seen (page 7) that the apertures are sometimes displaced in old herniæ, so that the internal and external rings finally lie in close apposition, as they did in the foetal state. Scarpa has noticed another displacement of the tendinous fibres of the external ring in large scrotal herniæ. "The superior pillar is forced so much upward and forward that the neighboring tendinous bands are made to approach each other, and are thus gathered together at the upper part of the ring, so as to give to it a degree of thickness and hardness much greater than it naturally possesses."

Finally, the effects of a hernia may be constitutional. The functions of the alimentary canal may be disturbed, causing *nausea*, *flatulence*, *indigestion*, and *constipation*. When the omentum has been protruded, there may result an injurious traction upon the stomach and colon, painful, dragging sensations, and not infrequently *colic*. Hence it is not uncommon to see persons afflicted with hernia become *emaciated*, and show *weariness*, *exhaustion*, and even suffering, from comparatively slight exertions. "In fact, the healthy performance of the nutritive processes is so much interfered with as to render them insufficient to compensate for the waste constantly taking place in the tissues."

CHAPTER II.

HERNIÆ : KINDS AND FREQUENCY.

KINDS OF HERNIÆ.

THE varieties of Herniæ as generally described derive their names from the time of life at which the hernial sac is formed, from the region of the body which is affected, from the viscus composing the protrusion, or from the condition in which their contents are formed.

As regards the time of life at which Herniæ may be found, we recognise *Congenital*, occurring either at time of birth or immediately thereafter; with its variety, the *Infantile* or *Encysted* Hernia; the former relating to the complete openness of the vaginal sheath of the tunica vaginalis, and the latter, the encysted, to the closure of the sheath at the abdominal parietes leaving a cavity below inclosed by the tunica vaginalis; *Accidental*, from whatever cause, whether undue exertion or severe injuries; and Herniæ as the result of weakness of the abdominal tissues.

Herniæ named from the region of the body in which they occur may be

Cerebral.—This term is applied to several different forms; one form may be due to a defect in the cranial ossification, another to a congenital deficiency of both cranium and integuments resulting in the speedy death of the infant, while a third form is seen as a result of the operation of trephining.

Diaphragmatic or Phrenic.—These are somewhat rare, often congenital, and when strangulated are beyond operative means of relief. The part of the diaphragm where the fibres are especially weak and deficient is “between the sides of the muscular slip from the ensiform appendix and the cartilages of the adjoining ribs.”¹

Umbilical, Exomphalos, Omphalocele, or Ruptured Navel.—These are more frequent in infants. When in adults they are more common in females than in males and in obese than in spare persons.² They protrude through the opening left

¹ They are of three kinds:—1st, where the muscular fibres of the diaphragm lose tone, so that the abdominal viscera are pressed into the thorax; 2ndly, where there is a congenital defect in the fibres; and thirdly, where the hernial tumour protrudes through one of the natural openings in the diaphragm which have been stretched.

² To illustrate some of the remarkable displacements in the thoracic and abdominal cavities that may result from this variety of Hernia, I make the following quotation from the *Proceedings of the St. Louis Med. Society* of a rather unique case. The report was made by Dr. Stevens:—

HERNIA OF THE TRANSVERSE COLON.

“I report this case from notes taken at the time of my observations. I was called by Dr. John Laughton to make the dissection in an examination of the body of Police-officer Holton. Besides Dr. Laughton, who had been the attending physician, there were present Dr. Thompson and Prof. Ellsworth Smith. About a year before death, and while in the performance of his official duty, Holton received a stab, made with a pocket knife. The wound was on the left side between the eighth and ninth ribs and about four inches from the sternum. The wound healed readily and without any alarming complications. After a few days, just at the site of the wound, there appeared a soft reducible tumour, about the size of half a hen-egg but causing no inconvenience. He returned to his occupation and continued to perform his duties for several months; in fact, till within a few days of the time of his death. The death was caused by enteritis and was not attributed to the lesion mentioned. In the long interval between the time of the injury and his death the case excited considerable interest and there was a wide difference of opinion as to the nature of the tumour, the majority believing it to be a Hernia of the lung; only one or two, as the sequel demonstrated, formed a correct diagnosis, viz: A Hernia of the transverse colon.

“Upon opening the cavity of the chest a most remarkable displacement

by the umbilical vessels of the foetus.¹ The visci found most frequently protruding are the epiploon or omentum, the jejunum, the arch of the colon and sometimes the stomach. The tumour is usually round, readily reducible and not very liable to strangulation. In the foetus the opening left by the umbilical vessels is perfectly patent but in the adult the aperture is so firmly closed that it is stronger than the linea alba itself. The linea alba however shows even in the normal state weak places around the vessels as well as various orifices in the tendinous parietes for small cutaneous blood-vessels. When from any unusual strain, as from pregnancy, these openings have yielded and

of thoracic and abdominal viscera was apparent. The stomach with its greater curvature upwards, was the first object in view; the left half, at least, of the transverse colon was above the plane of the diaphragm; the heart was found backward from its normal position, and the lung diminished by at least four-fifths of its usual dimensions driven to the extreme upper part of the cavity, and presenting more the appearance of a spleen than of a lung. It was wholly impervious to air. The right lung seemed to have expanded and have forced the mediastinum to the left of its normal location. The diaphragm of that side seemed to have almost disappeared; only a vestige remained showing its marginal attachment. You will readily form an idea of the enormous distension that had taken place in order to admit the passage upward of nearly the whole of the stomach and a large section of the colon.

"This then was the state of things as revealed by the autopsy. Our conclusions were as follows: That the knife first passed through the integument and intercostal structures, entering the pleural cavity during the act of expiration, the lung escaped injury; the blade then passed through the diaphragm without wounding any viscus beneath; that at first, a small section of either the colon or the stomach entered the opening in the diaphragm, and then by slow advances, so slow in fact as not to be perceptible to the individual himself, and so slow that the natural functions of the various organs implicated had ample time to conform their compensatory or other actions to the gradually changing relations. Probably it took weeks or months to work out the entire revolution.

"A rather interesting fact was mentioned by the attending physician, that the patient frequently vomited during his illness. Of course this must have been performed solely by the contraction of the muscular fibres of the stomach and without the action of the diaphragm and abdominal muscles."

. ¹ See p. 19.

become enlarged in adults, the protrusion of the viscus may be and often is called umbilical because *near* the umbilicus.

Thyroid.—In this variety the protrusion of the abdominal viscera comes through the thyroid or obturator foramen.

Ischiatic.—Protrusion through the sacro-sciatic notch.

Vaginal.—When the tumour descends along or into the vagina.

Perineal.—When the protrusion is through a laceration of the perineum of the male. It is the counterpart of the vaginal in the female.

Lumbar.—Of this variety a very few rare cases have been reported by Petit and Cloquet. The intestine is protruded through the posterior muscles immediately above the pelvis.

In the *anterior* region of the abdomen we have Inguinal and Femoral, the former protruding above and the latter below Poupart's ligament.

Of Inguinal Hernia there are two varieties.

External or Oblique.—Called external because the neck of the sac lies on the outer or iliac side of the epigastric artery. The intestine emerges through the internal abdominal ring, pushing before it a pouch of peritoneum, and then lies in the inguinal canal. "Pursuing the oblique direction of this canal, it emerges at the external abdominal ring, and enters the scrotum, into which it descends. The mouth of the hernial sac is situated to the outer side of the internal epigastric artery, whilst its neck and body are usually in front of the structures composing the spermatic cord. But in rare cases these organs are divided; sometimes the blood-vessels pass over the tumour, the vas deferens behind it, and *vice versa*; or they are attached to the sides of the tumour. The relative positions of the hernial tumour and testicle differ. The variable site of this latter organ depends upon congenital defect, and hence in some cases the testis cannot be distinguished from the tumour produced by the hernia.

However, in the majority of cases the testicle is situated at the posterior and inferior regions of the scrotum; more rarely, it may be detected at the front of the fundus of the tumour. An endeavour should always be made to ascertain the site of this organ, in every case of Inguinal Hernia, and under all circumstances.”¹

Internal or Direct.—Not so common a form as the oblique. It pushes through some part of the abdominal wall internal to the epigastric artery, *i.e.* on the pubic side of it, and passes *directly* through the abdominal parietes and external ring. “The mouth of the sac is close to the outer border of the pubic attachment of the rectus muscle, the posterior surface of which may be more easily felt when the Hernia is reduced than in the oblique variety.” “The finger enters the abdominal cavity much more readily in the direct form of Inguinal Hernia than in the oblique. In its passage from the abdomen it traverses merely that small portion of the inguinal canal which lies immediately behind the external inguinal ring, and those structures which form that part of the floor of that canal are either pushed before the Hernia, or they are lacerated when the hernial sac escapes through the opening so formed. Those structures are the conjoined tendons of the internal oblique and transversalis muscles and the pubic portion of the internal abdominal fascia. The spermatic cord and round ligament are not attached to the hernial sac until it has reached the external abdominal ring. When it has passed that point, they lie to its outer side, and are usually less identified with its tissues than in the oblique variety.”²

A rare anatomical variation is when the tumours pass not through the true external abdominal ring but through a division of the fibres of the external abdominal muscle near the ring.

Bubonocoele.—When an indirect or oblique Inguinal Hernia

¹ Beckitt.

² *Ibid.*

is incomplete, *i.e.* not fully formed or protruded, it is called a Bubonocoele, probably from its resemblance to an inflamed lymphatic gland in the groin (bubo).¹

Scrotal or Oscheocoele and Pudendal.—When a complete Inguinal Hernia passes through the external ring and escapes into the scrotum it is called Scrotal, when into the labia majora, Pudendal.

Ventral.—When it escapes through some part of the abdominal walls usually strong and muscular it is called Ventral Hernia.

Ventro-Inguinal.—When a Ventral Hernia slips into the inguinal canal it is called Ventro-Inguinal.

Femoral, Crural or Merocele.—This form of Hernia was not accurately differentiated from Inguinal until the middle of the seventeenth century, and its exact anatomical relations were not properly understood or described for many years after.¹ It protrudes through the femoral or crural ring, the upper opening of the crural canal in the angle formed by Gimbernat's and Poupart's ligaments, and emerges from the saphenous opening of the fascia lata in the upper and inner side of the thigh, the femoral veins lying on the outer side of the ring, and the epigastric artery crossing the upper and outer angle of the ring. It is more common in females than in males.

As regards the contents of the sac or the viscus composing the protrusion, if it be intestine, usually the small intestine and more particularly the ileum, we have an *Enterocoele*, if omentum we have an *Epiplocoele*, while a combination of the two is called *Entero-Epiplocoele*. Rarer forms of hernial tumours from the abdomen are Gastrocele,² Hepatocoele,³ and Cystocoele,⁴ protrusions of stomach, liver, and bladder.

The terms applied to the pathological conditions in which we

¹ It has passed through the internal ring but not the external, therefore it lies in the inguinal canal.

find Herniæ are *Reducible* when the protrusions can be readily returned to the abdomen.

Irreducible, a generic term to signify a Hernia that cannot be returned either because of adjoining adhesions, incarceration, strangulation, thickening of coverings or deposit of fat.⁵

Incarcerated, when the Hernia has become *temporarily* irreducible because of a constriction in the intestines which prevents passage of fæces.⁶

Strangulated, when the Hernia is irreducible because of a constriction which prevents not only passage of fæces but also *circulation* of blood in the tumour. This circulation may be impaired "by muscular spasm, œdema or the sudden forcing of additional contents into the sac." For the relief of this form of hernia, the operation of herniotomy or kelotomy must be employed.⁷

FREQUENCY OF HERNIA.

The frequency of the occurrence of Hernia varies in different kinds of herniæ according to kind, sex, age, population, occupation, walls of the abdomen, social state and the nationality.

1. *Relative frequency of the different Kinds*.—The Inguinal and Femoral are the most frequent, and after them comes Umbilical, while all the others can be considered as very rare. Out of the 93,355 Herniæ forming the total of the statistics published in 1855 by Bryant, we find 46,551 simple Inguinal to 7,452 Femoral without distinction of sex, being 1 Femoral to 6·24 Inguinal. Of 30,575 double Herniæ there were 28,503 Inguinal and 1,972 Femoral which gives the relation of 1 double Femoral Hernia to 14·25 double Inguinal. The sum of these figures gives 75,054 simple and double Inguinal to 10,425 simple and double Femoral, being 1 Femoral to 7·19 Inguinal. These figures may not form an absolute rule, but still the result of 93,355 cases ought

to be some guide to the relative occurrence of these kinds of Herniæ.⁸

2. *Relative frequency according to Sex.*—J. Cloquet states the relation of this occurrence as 2 males to 1 female. According to Malgaigne it is 4 males to 1 female. The tables prepared by the Truss Society of London give still different results, being 5 males to 1 female. According to Kingdon this last proportion is too great, leaving the relation given by Cloquet as nearer the truth. As regards the relative occurrence of Inguinal and Femoral Herniæ in the two sexes the Truss Society in 1855 claim about 1 Femoral in the male to, 75 Inguinal, but in the Report for 1863 give 1 Femoral to 32 Inguinal. It is so hard to understand such a difference in these figures that only a general idea must be drawn from them. According to the same Report of 1855 the relation in the female is 1 Inguinal to 4·6 Femoral, while according to Malgaigne Inguinal are even more numerous than Femoral in the female, although proportionally less than in the male. In the Report of 1863 the proportion was not quite 1 Inguinal to 1·04 Femoral in the female, figures which seem *à priori* much more reasonable.

As regards Umbilical Herniæ, they are more frequently found in the female than in the male.

3. *Frequency according to Age.*—In 300 Herniæ examined by Malgaigne

26	occurred between the ages of			10—20
45	”	”	”	20—30
66	”	”	”	30—40
163	”	”	”	40—80
<hr/>				
300				

4. *Frequency in Relation to Population.*—According to the same authority above cited—

Before 1 year there is 1 Hernia in every 21 individuals.

From	1— 2	„	1	„	29	„
	„	2— 3	„	1	„	37
	„	5—13	„	1	„	77
To	20	„	1	„	32	„
	„	28	„	1	„	21
From	30—35	„	1	„	17	„
	„	35—40	„	1	„	9
At	50	„	1	„	6	„
	„	60—70	„	1	„	4
	„	70—75	„	1	„	3

He estimates the proportion of the whole population of France which is ruptured to be 1 out of every 13 males, and 1 out of every 52 females, or taking both sexes together 1 out of every 20·5 individuals.

5. *Frequency according to Occupation.*—In a general way we may say that the more difficult the occupation the more liable are those engaged in it to suffer from Herniæ. Here as in all other tables of a similar nature, figures can be only approximately valuable and must not be relied upon as absolute. The following table I believe to be as nearly accurate as can possibly be.

REPORT OF KINGDON (TRUSS SOCIETY).

According to Census of 1851.	1859.	1860.	1861.
Farm labourers	—	171	173
Farmers	776	503	734
Boot and Shoemakers	58	53	12
Carpenters and Joiners	173	178	99
Tailors	20	33	28
House servants (male)	101	176	131
Workers in Silk	63	71	58
Blacksmiths	48	51	63
Masons and Paviers	—	18	—
Porters and Gardeners	478	410	351
Gardeners	65	119	114
Brickmakers	—	—	49
Butchers	53	52	52
Painters and Plumbers	33	45	50
Breadmakers	35	69	52
Carters	73	87	82
Commercial Brokers	29	30	65
Clerks	—	—	41
Boatmen	—	44	35
Sawyers	35	34	29
Pedlars	33	57	37
Wheelwrights	10	—	18
Engineers	25	51	42
Coopers	20	32	23

We can, however, go further than this and investigate the influence of position during work. This question has been especially discussed in regard to Inguinal Herniæ, and the question that has arisen is, "Are various attitudes capable of modifying the diameter of the Internal Abdominal Ring and of the Inguinal Canal?" Here again, all that is best known on the subject rests upon the authority of Malgaigne, who is content to say that occupations requiring the adduction and flexion of the thighs expose the bowels to displacement much more than the occupations allowing a normal position of the body. Thompson and Richet on the other hand, think that adduction of the thighs will relax the *external* ring, it being impossible to modify the dimensions of the *internal*

ring by special attitudes. If this be really so, the effect of position will be to modify not the causation of Hernia but only the development when the Hernia has once been formed.

6. *Frequency according to the Side of the Body.*—Herniæ as a rule are more frequent on the right side than on the left, and that in the proportion of 7 to 4 or 5. The reason for this has been variously expressed. Schinkius thought it due to the larger lobe of the liver being upon the right side, Martin to the inclination of the mesentery, Cloquet to the predominance of those who are right-handed in their actions over those who are left-handed. This seems by far the best and most plausible way of accounting for the fact, since we observe that in all movements of the right side the diaphragm forces the abdominal viscera downward, forward, and to the right side. Malgaigne as usual doubts the statement, and by figures seeks to show that Herniæ in right-handed persons are more frequently on the left side than on the right. Thus of 313 Inguinal Herniæ 40 were double, and of the 273 remaining, 171 were right and 102 left, while of the 273, 1 out of every 11 was left-handed.

7. *Frequency according to Race of Men.*—As regards the race most frequently afflicted with this abdominal weakness, it has been found that inhabitants of warm climates are more often “ruptured” than those of temperate and cold regions. Then of course we can make the general statement that the hard toiling nations are more like to be “ruptured” than those who lead a more moderate life. This will as well apply to the different orders of men in the same nationality, and when thus much has been said, we can say no more that could be of the least authority or practical value.

CHAPTER III.

ANATOMY : DESCRIPTIVE AND SURGICAL.

ANATOMY OF HERNIA : DESCRIPTIVE AND SURGICAL.

OF all these varieties, the kinds most commonly met are the Umbilical, the two varieties of Inguinal and the Femoral ; to these we will now more particularly confine our attention, defining minutely the anatomy, coverings and symptoms, their several variations under unusual conditions, differentiating diagnostically between them individually, and also between them and the other abnormal conditions of the abdominal region likely to be confounded with Herniæ. For this purpose I have, besides consulting other authors, made many extracts from Gray, Anderson, Lawrence, Beckitt and Ranney, to whom I wish to give due credit for their labours, researches and writings.¹

SURGICAL ANATOMY OF UMBILICAL HERNIA.

This protrusion is *directly* through the abdominal parietes at the navel, or umbilicus, or its immediate vicinity. Passing from without inwards we meet the integument, superficial fascia, the aponeurosis formed by the union of the oblique and transversalis

¹ *Descriptive Anatomy.* By Henry Gray.—*System of Surgical Anatomy.* By William Anderson. New York, 1822.—*A Treatise on Ruptures.* By W. Lawrence. Philade'phia, 1843.—*A System of Surgery.* Edited by T. Holmes. Vol. IV.—*Surgical Diagnosis.* By Ambrose L. Ranney. New York, 1879.—*The Essentials of Anatomy.* By William Darling and Ambrose L. Ranney. New York, 1880.

muscles, the fascia transversalis, a layer of sub-peritoneal cellular tissue often containing fat and a pouch of the parietal layer of peritoneum, forming the hernial sac. These coverings being of more importance in Inguinal Hernia will be there more fully described. In Umbilical Herniæ these coverings may become so inseparably united and thinned that they appear as one and allow the contents of the sac to be seen from the surface. Other variations in the coverings have reference to the method of formation of the sac. If it be suddenly produced, not only may the tendon of the external oblique be wanting but also the superficial fascia and the fat. If the tumour be formed before the separation of the umbilical cord, it passes directly through the umbilicus into the substance of the cord and gains from it a peculiar covering. No blood-vessels, unless it be superficial vessels or abnormal veins, as seen by Manec, Mèniere and Velpeau, are situated near a Hernia in this region. The contents of an Umbilical Hernia are usually both omentum and intestine, entero-epiplocele. Other viscera besides the large and small intestine may be inclosed by the sac, as for example the stomach or uterus.

The firm margin of the umbilical ring forms an unyielding ring around the neck of the sac which is itself thicker at this point than over the body of the sac. As the tumour increases in size it does not extend uniformly over the abdominal surface but downwards towards the symphysis pubis more than in any other direction. It may be sessile with an immense base, or pyriform, and suspended by a peduncle or stalk.

In the *Fœtus*, umbilical Hernia is always in consequence of a defective development in the abdominal walls, as I have already said, and is often associated with other malformations such as hare-lip or club foot. It has a covering formed by the union of the peritoneum and the envelope of the umbilical cord. If the

tumour be large, death often takes place from peritonitis a few days after birth.

In the *child*, umbilical protrusions occur usually after some violent muscular exertion, as coughing or crying, are small and

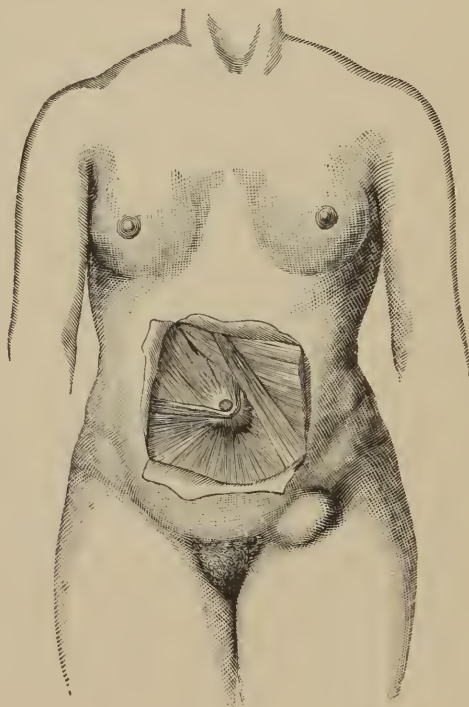


FIG. 1.—Umbilical Hernia.

The three most common forms of Hernia, named in the order of their occurrence in the female, are Umbilical Femoral and Inguinal. Oblique Inguinal, or Pudendal in the female, is very finely shown on the right side of the figure. Umbilical as well as Femoral on the left side speak for themselves. The fibres and fascia transversalis in the Umbilical region are very well drawn, and show the appearance of a Hernia in that stage of its formation when the intestine has already passed the internal ring and commenced to protrude from the external surface.

conical and almost always contain only intestine and not omentum.

In the *adult* I have already said this variety of Hernia is not

strictly umbilical, but only so-called by convention and for convenience of classification. The tumour is globular or pyriform, and in corpulent persons tends to insinuate itself into the adipose tissue downwards towards the pubes. Thus it may for years exist unsuspected because concealed in this way. In such a state too there is great danger of strangulation and fatal results. Such Herniæ more frequently exist in fleshy women who have borne many children, than in men.

Certain symptoms are characteristic. The tumour at first is small, soft and ovoid. It readily reduces by pressure, when a distinct sharp outline of the umbilical ring can be felt by the finger. On removing the finger the skin either remains creased in folds or it gradually distends until the tumour re-appears. On coughing a distinct impulse in the tumour is felt by the finger. In adults, who have Umbilical Hernia, any tenderness of the abdomen, constipation or nausea should be carefully watched as giving symptoms of possible strangulation. (For diagnosis from Ventral Hernia see Table on p. 80.)

SURGICAL ANATOMY OF THE ABDOMINAL REGION RELATING TO INGUINAL HERNIA.¹

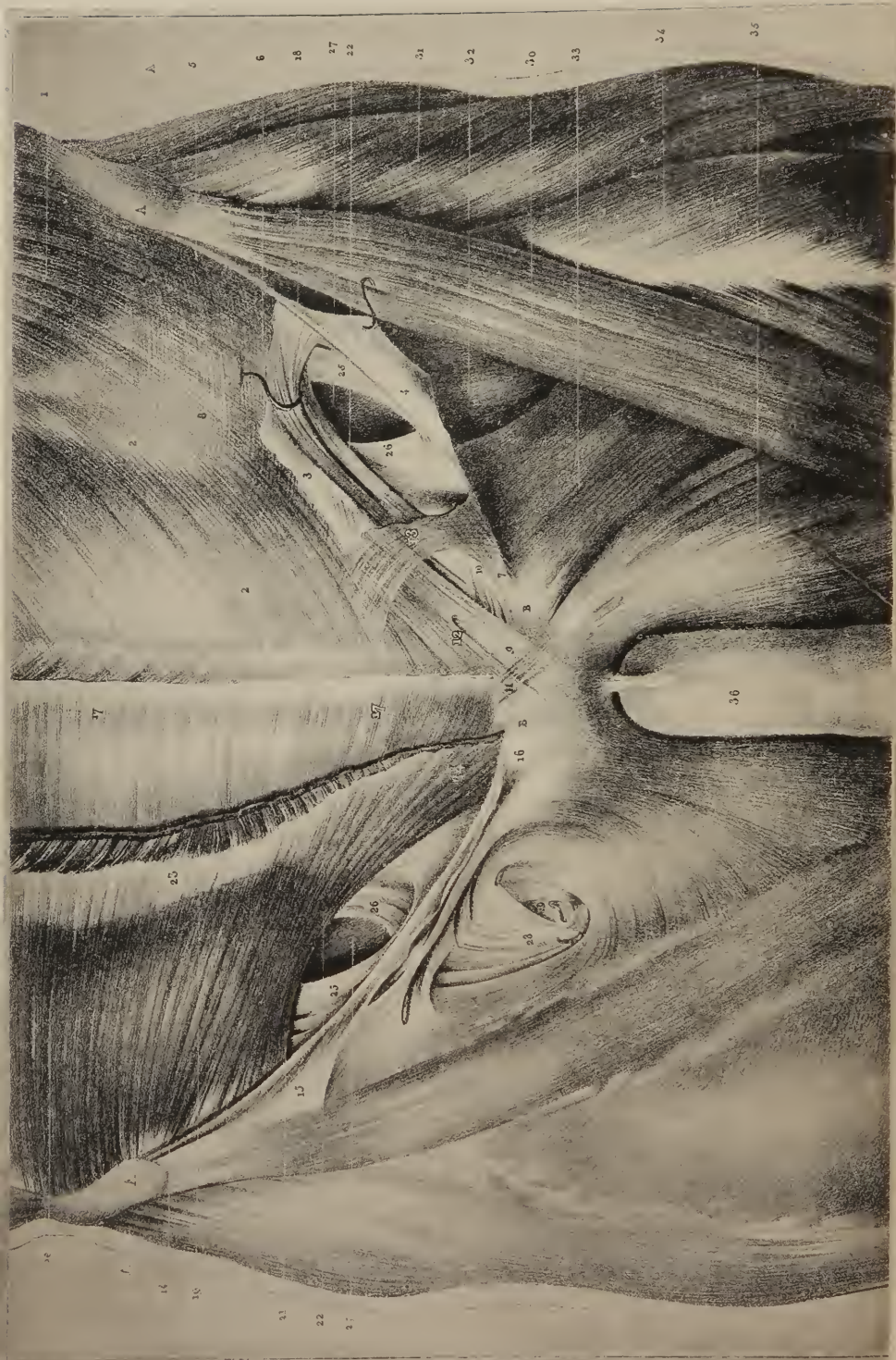
The superficial fascia of the abdominal region is of two layers, between which are the superficial vessels and nerves and the inguinal lymphatic glands. It was first described by Camper. The superficial layer is thick and areolar, and contains adipose tissue. The deep layer is thin, aponeurotic and strong. It adheres in the middle line to the linea alba, and below to Poupart's ligament and the fascia lata, although it does not increase the strength of the abdominal ring. Between them are the superficial epigastric, circumflex iliac and external pudic arteries and veins, terminations of the ilio-hypogastric and ilio-inguinal nerves and the upper group of the inguinal lymphatics.

¹ See p. 160.

These cutaneous arteries all arise from the femoral, about half an inch below Poupart's ligament. The *superficial epigastric* passes through the saphenous opening, crosses Poupart's ligament midway between the spine of the ilium and pubes, and ascends nearly as high as the umbilicus, anastomosing with the deep epigastric from the external iliac and with the internal mammary from the subclavian. It supplies the integument and fascia. Its vein enters the internal or long saphenous. The *superficial circumflex iliac* runs parallel with Poupart's ligament out to the crest of the ilium. The *superficial external pudic* passes inward across the spermatic cord to supply chiefly the integument of the penis and scrotum of the male and of the labia of the female.

The *ilio-inguinal* nerve pierces the transversalis and internal oblique muscles, and escaping at the external abdominal ring accompanies the spermatic cord to the scrotum and thigh.

The *aponeurosis of the external oblique* muscle lies beneath the fasciæ. It is thin and strong with fibres running downward and forward. The lower edge of the aponeurosis, thickened and stretched like an arch between the anterior superior spinous process of the ilium and the spine of the pubes, is called Fallopius' or Poupart's Ligament, and under Femoral Hernia will be spoken of as the femoral or crural arch. It is narrow behind and increases in breadth towards the front. On the superior surface is a concavity for the spermatic cord. The reflection of this ligament backwards and inwards to the iliopectineal line is called Gimbernat's ligament, which is about an inch in length although larger in the male than in the female and almost horizontal in the erect position. It is triangular in shape; its outer margin or *base*, concave and sharp, being in contact with the crural sheath and blended with the pubic portion of the fascia lata; its *apex* joining the spine of the pubes. A reflection of this ligament extending behind



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PLATE A. STUDY OF THE INGUINAL CANAL.

By BOURGERY.

[As a curiosity of language, the descriptions of these three plates will be given in the words of the original translation.]

Details of the inferior extremity of the Great Oblique and Transversal, and their relations with the Groins and origin of the Thighs.

Left side of the Subject: Great Oblique, whose aponeurosis is half open, and thrown back to shew the interior of the inguinal canal, the cremaster being removed. The circumference of the ring is preserved in form of a stay. The thigh represents the upper extremity of the superficial muscles.

Right, side: Femoral transversal and aponeurosis.

EXPLANATION OF THE PLATES.

The explanation refers to two plates which have been combined.

A, A. Anterior and superior iliac spines.

B, B. Pubic spines.

LEFT SIDE.

1. Inferior extremity of the great oblique.
2. Its aponeurosis.
- 3, 3. Shreds of the aponeurosis, inverted, to show the inguinal canal.
5. Origin of Poupart's ligament.
6. Cut of the small bands, from whence the external pillar proceeds.
7. External pillar, implanted upon the spine of the pubis.
8. Small band, from whence the internal pillar proceeds.
9. Internal pillar. Between the two pillars is the inguinal ring.
10. Internal inguinal ligament.
11. Extremity of the internal pillar of the right side.
12. First band of insertion to the pubis, separated from the internal pillar by the arcade of passage to the ilio-scrotal nerve.
13. Extremity of the aponeurosis which closes the ring, preserved in form of a stay.

RIGHT SIDE.

14. Origin of Poupart's ligament in the iliac spinal.
15. Aponeurosis, thrown back upon the thigh.
16. Its tie, forming the external pillar.
17. Aponeurosis of the little oblique, in front of the great right.
18. *Left side:* Last ties of this muscle in the gutter of Poupart's ligament. The arcade which it forms is raised up by a hook, to let the transversal be seen.
19. *Right side:* Extremity of the fibres of the little oblique inverted within, to let the aponeurosis of the transversal be seen.
20. Idem. Transversal.
21. Idem. Last ties of this muscle in the gutter of Poupart's ligament.
- 22, 22. Summit of the arcade which it forms above the internal orifice of the inguinal canal.
23. Aponeurosis of the transversal.
24. Inferior tie of the pubis. It is the same aponeurosis which is seen through the orifice of the left inguinal ring.
- 25, 25. *Of the sides:* Thick edge of the fascia-transversalis, which limits the superior orifice of the inguinal canal outside, and then unites itself with the gutter of Poupart's ligament.
- 26, 26. Idem. Very fine portion of the same fascia, which forms the internal edge of the orifice. Behind a fibro-cellulous sheet are seen the epigastric vessels which ascend parallelly to the internal edge.
- 26, 27. Idem. Ellipsoidal internal orifice of the inguinal canal.
28. *Right side:* Superficial aponeurotic leaf, applied upon the crural vessels.
29. Idem. Section of the internal saphenous vein, which crosses the femoral aponeurosis (inferior crural ring), in order to through itself into the femoral vein.
30. *Left side:* Sartor muscle.
31. Fascia-lata.
32. Reflected mass of the psoas and iliac.
33. Pectiné.
34. Anterior right.
35. First abductor.
36. Penis.

the internal pillar of the external abdominal ring to the linea alba is called the *triangular* ligament. In the middle line of the body, the fibres of this aponeurosis join with the fibres from the aponeurosis of the corresponding muscle on the opposite side to form a thickened line from the ensiform cartilage to the pubes, the linea alba, formed by the union of the aponeurosis of the oblique and transversalis muscles.

About an inch and a half from the pubes the thickened fibres of the aponeurosis separate to form the *pillars* or *columns* of the external abdominal ring. The *internal* or *superior* pillar is broad, thin and flat, and attached to the upper edge of the pubes near the symphysis. It interlaces with fibres from the opposite side. The *external* or *inferior* pillar is narrower, thicker and stronger, is inserted into the spine of the pubes, and is curved around the spermatic cord to form the groove above mentioned. The separation of these tendinous pillars leaves a triangular opening over the pubes, called the external or abdominal ring. The pubes forms the base of the triangle and the tendinous columns the sides. At the apex are some curved fibres, intercolumnar fibres, which increase the strength of the aponeurosis, and are more developed in the male than in the female. Through this triangular opening passes the spermatic cord in the male and the round ligament of the uterus in the female. Over the outer surface of the cord and testis is prolonged a thin fascia, the *intercolumnar* or *external spermatic fascia*, attached to the pillars of the ring. The abdominal ring, or more properly triangular aperture, is directed upward and outward. When distended by a Hernia it assumes more of a circular form, so that then the appellation of ring is much more appropriate. Its size and form vary; sometimes it is rounded, and closely embraces the cord or round ligament, sometimes elongated, and sometimes square. It is usually about an inch in its long diameter from pubes to internal angle, and about one half inch

transversely between the columns. It is larger and stronger in the male than in the female.

The fascia of the obliquus internus muscle along the middle line over the rectus for the upper two-thirds of its extent is divided into two layers, of which the outer is blended with the fascia of the obliquus externus, while the inner is blended with the transversalis fascia. In the lower third all this expansion of

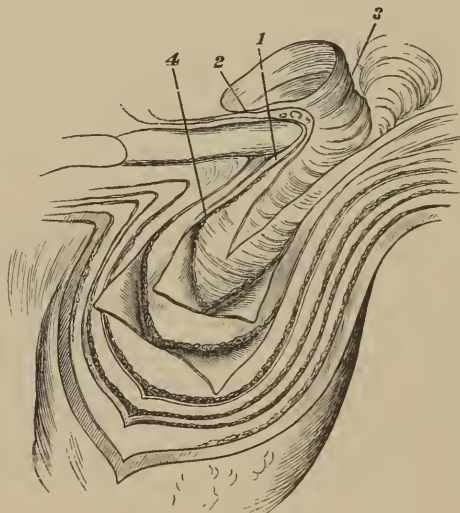


FIG. 2.—Lingual Hernia.

This figure shows the various coverings; 1, skin, superficial fascia; 3, intercolumnar fascia; 4, cremaster muscles, infundibulum fascia, subserous cellular tissue; 2, sac, epigastric artery with veins on either side of it.

fasciæ passes in front of the rectus. The fibres of the internal oblique from the upper half of Poupart's ligament arch downward and inward across the spermatic cord, to be inserted with the tendons from the transversalis as the *conjoined* tendon into the crest of the pubes and pectineal line for half an inch. It lies behind, and so closes Gimbernat's ligament, and the external abdominal ring, and strengthens the ring towards the abdomen. Sometimes it is insufficient to resist the pressure

from within, and is protruded as one of the coverings of direct inguinal Hernia.

The *Fascia Transversalis* lies between the inner surface of the transversalis muscle and the peritoneum, and closes the ring of the external oblique toward the muscle ; otherwise there would be a direct opening into the abdomen behind the ring. Thick and dense in the inguinal region, it becomes thin and cellular as it ascends toward the diaphragm.

The internal abdominal ring is an oval opening, running upwards and downwards, much larger in the male than in the female, situated in the transversalis fascia "midway between the anterior superior spine of the ilium and the spine of the pubes, and about half an inch above Poupart's ligament." The following description of this ring is taken from Sir Astley Cooper, who first noticed the fascia in which it occurs.

The edges of this ring "are indistinct on account of its cellular connections with the cord ; when these are separated, the fascia of which it is formed will be found to consist of two portions : the outer strong layer, connected to Poupart's ligament, winds in a semi-lunar form around the outer side of the cord and bounds the aperture by a distinct margin, from which a thin process may be traced passing down upon the cord. The inner portion which is found behind the cord is attached to, but less strongly connected with, the inner half of the crural arch, and may be readily separated from it by passing the handle of a knife between it and the arch. It ascends between the tendon of the transversalis, with which it is immediately blended, passes around the inner side of the cord, and joins with the outer portion of the fascia above the cord, being at length firmly fixed in the pubes ; the inner margin of the ring is less defined than the outer, the fascia transversalis being doubled inwards towards the peritoneum to which it is firmly attached. Thus, then, it appears that the internal ring is not a circumscribed

aperture like the external abdominal ring, but is formed by the separation of two portions of fascia, which have different attachments and distributions at the crural arch; the outer portion terminating in Poupart's ligament while the inner portion will be found to descend behind it, to form the anterior part of the sheath that envelopes the femoral vessels. The strength of this fascia varies in different subjects; but in all cases of inguinal Hernia it acquires considerable strength and thickness especially at its inner edge; and if these parts had been formed without such a provision, the bowels would, in the erect posture, be always capable of passing under the edge of the transversalis muscle, and no person would be free from inguinal Hernia.¹

The opening then in the abdominal parietes for the passage of the spermatic cord is not a simple aperture, but an oblique canal, the abdominal or *Inguinal Canal*, although it is not properly a canal unless distended by a Hernia. In its normal state it is merely a flattened passage. The crural arch running from the anterior superior spine of the ilium to the spine of the pubes, and forming a channel in which lie the psoas and iliacus muscles, with the femoral vessels, gives attachment to the internal oblique and transversalis muscles, and contains in its lower half the spermatic cord or the round ligament. The external oblique presents in the lower and inner parts of its aponeurosis above the pubes the triangular opening called the external ring, but now more properly the lower or external opening of the inguinal canal. This space between the tendinous columns of the ring is closed behind by the insertion of the internal oblique into the pubes. Hesselbach has accordingly called it the "crural surface of the anterior inguinal ring." It is the only place where the internal is left uncovered by the external oblique muscle. The corresponding surface on the posterior or abdominal side

¹ Cooper on Hernia, part I. p. 6, ed. 2.

of the canal is a triangular space bounded on the inner side by the outer edge of the rectus abdominis, on the lower by the pubes, or as usually given by, Poupart's ligament, and on the outer by the femoral and epigastric vessels. This has been called the "triangular inguinal surface," or Hesselbach's Triangle. It is the weakest part of the abdominal parietes, being covered only by the transversalis fascia and the conjoined tendon. The inguinal canal is bounded posteriorly, or on the abdominal aspect, by the transversalis fascia, in which is the opening of the internal abdominal ring, higher and more external than the external ring, and about an inch and a half distant from it.

Besides the superficial epigastric artery coming off from the femoral, the surgeon must pay particular attention to the deep epigastric from the external iliac. It arises immediately above the crural arch in a loose cellular structure. Concealed at first by the crural arch, it lies behind the obliquus internus and transversalis, and is covered by the spermatic cord just before the cord enters the inguinal canal. It ascends obliquely inward between the transversalis fascia and peritoneum to the outer margin and posterior surface of the rectus, running "along the lower and inner edge of the internal abdominal ring, in general, precisely along the inner margins, but sometimes rather nearer to the pubes, passing at the distance of nearly an inch from the upper extremity of the ring of the external oblique." It lies behind the inguinal canal and immediately above the femoral ring.

It is accompanied by two veins, the larger of which is always found upon the inner side. They unite into a single vein before they terminate in the external iliac vein. Several small branches of the artery ought to be known to the operating surgeon, the *cremasteric*, which accompanies the spermatic cord, the *pubic*, which runs across Poupart's ligament and then descends to the inner side of the femoral ring and the *muscular* branches.

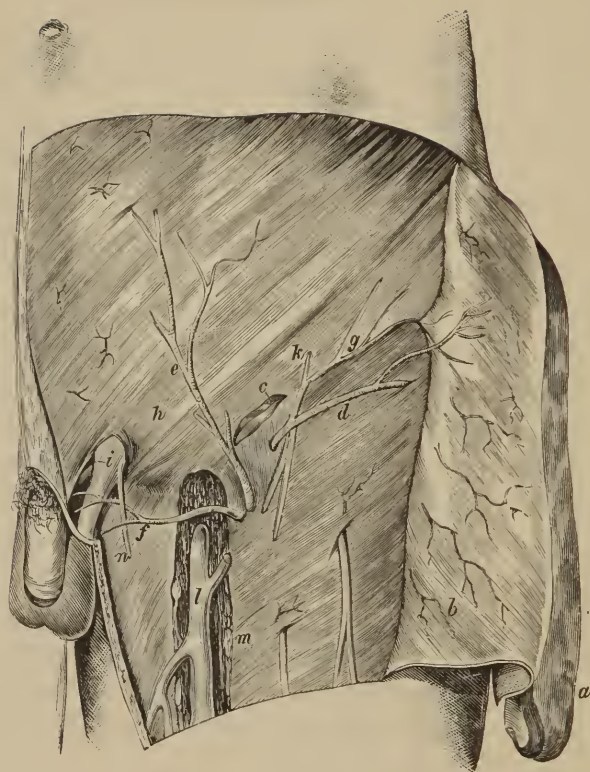


FIG. 3.

Superficial dissection of inguinal and crural regions. Below the groove upon front of thigh is seen the triangular depression forming the lower part of groin. This is described in connection with Femoral Hernia. Above the pubis may be felt the opening, in the deep parts, of the superficial abdominal ring through which the spermatic cord escapes to testicle. Beneath the skin of groin and fascia superficialis are two layers, between which are found the superficial vessels and lymphatics. The layer below this is made up of elastic areolar tissue and fat, closely attached to Poupart's ligament at spine of pubis and crest of ilium, *q*. Crossing the groin are seen three blood-vessels turned obliquely inwards and upwards from common femoral artery. Outer one, superficial circumflex iliac, passes up to superior iliac spine, *d*. The middle one, superficial epigastric, supplying glands and integuments of groin to umbilicus, *e*. Inner one, *f*, superficial external pubic, enters fascia lata near the pubis, crossing beneath spermatic cord to scrotum and root of penis. The external pubic is liable to be divided in cure of Inguinal Hernia; if a dull bistoury be used in making the division, hæmorrhage is less liable to occur, unless the vessel is very much enlarged, which is the case sometimes in old and large ruptures.

The abdominal wall is made up of layers of muscular and aponeurotic tissue below the iliac crests. The external oblique is very strong, and the fibres curve downwards and inwards towards median line and pubis, forming with other tendons a vertical line and by union with opposite side linea alba.

Externally towards thigh, fibres growing thicker and oblique, running in with fascia lata, and uniting with deeper fascia form crural arch or ligament of Poupart, *g*. This band of fibres is attached to, and forms an arch between anterior superior iliac spine and spine of pubis. It has a slight convexity downward, outward, and backward so as to form the hollow of the groin. The fibres of the aponeurosis are bound together by tough areolar tissue which can be traced downward into the *intercolumnar* fascia, *h*. Through various sized openings in this fascia pass vessels and nerves into abdominal wall. One of these larger openings is the external ring, *i*.

There are considerable variations in the point of origin of the artery. It may arise "from any part of the external iliac between Poupart's ligament and two inches and a half above it, or it may arise below this ligament from the femoral or from the deep femoral."

The measurements of these parts vary so in the two sexes that the subjoined tables by Sir Astley Cooper, from the measurements of well-developed persons, will be of especial value. Although the distances will be somewhat different according as the person be large or small, the relative proportions will be the same.

	MALE. inches.	FEMALE. inches.
From symphysis pubis to anterior superior spine of ilium .	5 $\frac{3}{4}$	6
to tuberosity of pubes	1 $\frac{1}{8}$	1 $\frac{3}{8}$
to inner margin of the lower opening of the abdominal canal .	$\frac{7}{8}$	1
to inner edge of the upper opening	3	3 $\frac{1}{4}$
to middle of iliac artery	3 $\frac{1}{8}$	3 $\frac{3}{8}$
to iliac vein	2 $\frac{5}{8}$	2 $\frac{3}{4}$
to origin of epigastric artery .	3	3 $\frac{1}{4}$
to course of epigastric artery on inner side of upper opening .	2 $\frac{3}{4}$	2 $\frac{1}{8}$
to middle of the lunated edge of fascia lata	2 $\frac{3}{4}$	3 $\frac{3}{4}$
From the anterior edge of the crural arch to the saphena major vein	1	1 $\frac{1}{2}$
From symphysis pubis to middle of crural ring	2 $\frac{1}{4}$	2 $\frac{3}{8}$

The transversalis muscle and fascia with the epigastric vessels which form the anterior boundary of the abdomen are lined behind by the peritoneum, which presents a well-marked depression or pouch. A thin fibrous prolongation extends for

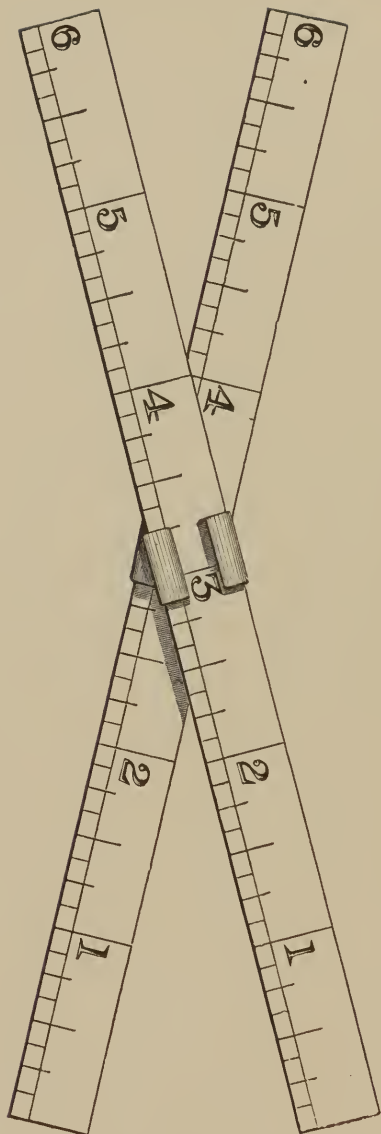


FIG. 4.—Rule.

This sliding and revolving rule will be found very handy in taking these anatomical measurements. This was loaned to me by T. Bryant, Surgeon at Guy's Hospital.

a short distance over the front of the spermatic cord, and is the remains of the pouch of peritoneum which in the fœtus accompanies the descent of the cord and testis into the scrotum, and which soon after birth begins to be obliterated. (See page 13).

The spermatic vessels situated behind the peritoneum descend over the psoas and iliacus internus muscles connected to them by loose cellular tissue, and at the divisions of the transversalis fascia are joined by the vas deferens at an acute angle. This union forms the spermatic cord, composed therefore of arteries, veins, lymphatics, nerves, and vas deferens invested by its proper coverings. Making a sudden bend upward, it enters the inguinal canal through the inner abdominal ring, and running obliquely downward and inward in the inguinal canal between the transversalis fascia and the aponeurosis of the external oblique, emerges at the external abdominal ring. It then descends nearly vertically into the scrotum, lying on the outer pillar of the external ring so as to cover its insertion into the pubes.

In its passage through the inguinal canal the cord is strengthened by the cremaster muscle, which consists of scattered bundles of pale reddish fibres derived from the internal oblique during the descent of the testis. They form around the cord and testis a series of inverted arches or loops, rather difficult to dissect. As to their insertion, M. Cloquet says, "the lower fibres of the internal oblique, traversing the external angle of the ring in front of the cord, ascend again immediately, to be fixed to the pubes behind the external pillar of the ring, forming loops of small extent, with their concavity directed upward."

These parts forming the cord are joined together by a cellular structure which Scarpa thus describes:—

"The soft cellular texture which envelopes the spermatic vessels behind the great bag of the peritoneum, and accompanies them under the fleshy edge of the transversus muscle

passing with them through the separation of the lower fibres of the obliquus internus and along the inguinal canal into the groin and scrotum, continues to surround them as far as the part where they terminate in the testicle. This cellular investment,



FIG. 5.

Deep dissection of inguinal canal and abdominal wall. *a*, external oblique thrown back over Poupart's ligament; *b*, internal oblique; *c*, transversalis muscle; *d*, conjoint tendon; *e*, rectus muscle; *f*, transversalis fascia; *g*, triangular aponeurosis formed by a layer of fibrous tissue passing across linea alba from aponeurosis of external oblique of opposite side. These fibres pass outward and downward to pubic symphysis, crest and spine, or even to pectineal line, where they are implanted with those of the conjoint tendon; *h*, muscular fibres of the cremaster.

The fascia transversalis, uniting at the groin with fibres of the tendon of the transversalis muscle, is closely connected with Poupart's ligament, iliac fascia and conjoint tendon. Here it forms the oval opening of the internal abdominal ring and gives off over the cord, the funnel-shaped investment called the fascia propria or infundibularis, *i*.

being a continuation of that which connects the great bag of the peritoneum to the muscular and aponeurotic parietes of the abdomen, becomes thicker and more copious as it approaches the part where the vessels pass out of the inguinal ring, and after that passage it is enclosed together with the vessels and the tunica vaginalis testis in the muscular and aponeurotic sheath formed by the cremaster, which extends to the bottom of the scrotum. If we make a small opening into the upper part of the sheath and impel air through it, the cellular texture is immediately distended, and the cord is swelled into the form of a cylinder extending from the groin into the scrotum as far as the attachment of the vessels to the testicle, where a circular groove or depression is seen marking the boundary between the cellular substance of the cord and the tunica vaginalis testis. While the part is thus artificially distended we may carefully slit up the sheath of the cremaster and expose the investment of the cord, which is then seen as a vesicular spongy tissue with large and long cells capable of extension without tearing. The spermatic vessels are seen running through it separate from each other, and near them is that prolongation of the peritoneum which constitutes in the infant the neck of the tunica vaginalis testis. The diffused hydrocele of the spermatic cord affords another proof how easily this cellular texture may become distended. The cellular sheath of the spermatic cord, which constitutes an investment of tolerably close texture, is connected to the margins of the opening of the transversalis, and again to the external abdominal ring. The cremaster muscle contributes further to fix and support the cord in its passage through the abdominal parietes, while it provides for the necessary movements of the testicle."

To recapitulate: of inguinal Hernia the great majority of cases are of the external or oblique variety. The viscera protrude "through the opening left between the two portions of the

fascia transversalis and under the margin of the internal oblique and transversalis muscles: that is, at the point where the tunica vaginalis communicates with the abdomen in the fœtus, and where the spermatic cord passes out in the adult." The mouth of the sac is at the upper or inner opening of the

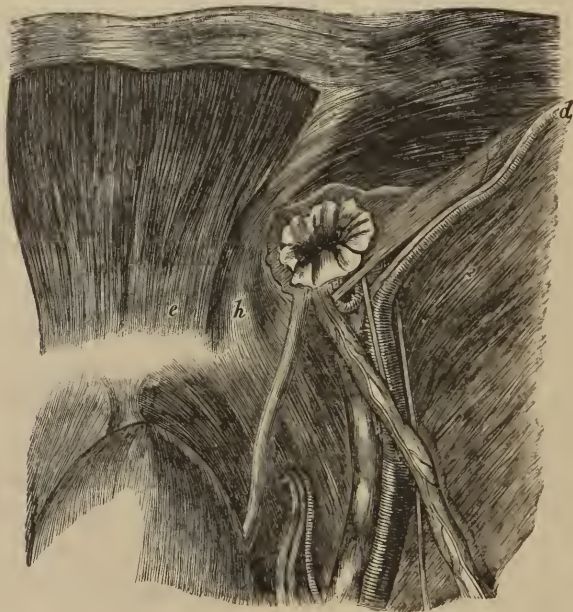


FIG. 6.

Dissection from the peritoneal surface of the parts affected by an oblique rupture; peritoneum, its fascia and the transversalis fascia are removed. The sac is cut off at its neck in the deep ring. The epigastric artery is seen below the neck, but has been removed at the inner side to show conjoint tendon, *h*.

inguinal canal, and is therefore midway between the anterior superior spine of the ilium and the spine of the pubes. The normal distance between the internal and external rings is rarely seen in Herniæ of long standing; in fact the normal distance is rarely preserved in any *complete* inguinal Hernia. The spermatic cord is placed behind the hernial sac. After the

Hernia has escaped beyond the external ring, however, many variations in the relations of the cord to the sac may be presented. It may be found at the sides or even on the anterior surface, or, as often happens, the vas deferens and the spermatic vessels, owing to the great pressure following the distension, may

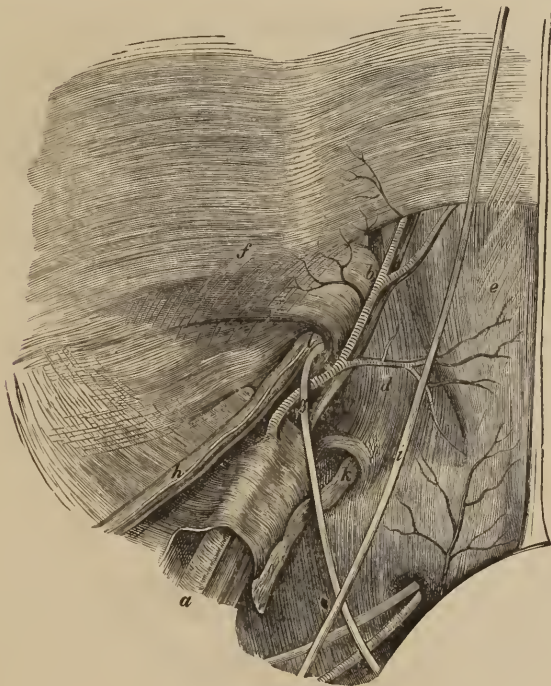


FIG. 7.

Dissection of Inguinal and Crural Hernia from internal surface, the peritoneum and fascia being removed. *a*, external iliac artery; *b*, epigastric artery, branch of *a*; *d*, deep circumflex iliac, lying in Hesselbach's triangle; *e*, rectus muscle; *f*, fascia transversalis; *g*, vas deferens or spermatic duct; *h*, spermatic plexus of veins with artery and nerves; *i*, obliterated cord of hypogastric artery; *k*, lymphatic glands. At the internal ring may be seen subperitoneal fascia, *l*, enveloping the cord, *h*.

separate, the former on the inner side of the tumour and the latter on the outer. An internal or direct inguinal Hernia protrudes through the fascia transversalis at Hesselbach's triangle and then through the external abdominal ring. Such a Hernia

according to Cooper, takes place "if this tendon is unnaturally weak ; or if from malformation it does not exist at all ; or from violence has been broken." The spermatic cord lies usually on the outer side of the sac, although it may lie behind it as in the external or oblique variety. The epigastric artery is pretty constant in its relation to the Hernia, that is, in its normal state about three-quarters of an inch from the upper and outer extremity of the external ring, although Hesselbach records a case in which he found the epigastric so near the symphysis pubis that had a direct Hernia taken place the artery would have been upon the inside of the mouth of the sac.

The inguinal canal has the following boundaries, which have been taken from Darling :—

In front (5 structures)	{ Skin. Superficial fascia (2 layers). External oblique (<i>entire</i> length). Internal oblique (outer third).
Behind (5 structures)	{ Conjoined tendon of internal oblique and transversalis. Transversalis fascia. Triangular ligament. Sub-peritoneal tissue and fat. Peritoneum.
Above (2 structures)	{ Fibres of internal oblique. Fibres of transversalis.
Below (2 structures)	{ Poupart's ligament. Transversalis fascia.

*Femoral Hernia.*¹—The superficial fascia of the femoral region is of two layers just as in the abdominal region, between which are the cutaneous vessels and nerves and the lymphatic glands. These vessels are the *internal saphenous* vein and the *superficial epigastric*, *superficial circumflex iliac*, and *superficial external pubic* arteries from the femoral, while the cutaneous nerves are from the *ilio-inguinal*, *genito-crural*, and *anterior crural* from the lumbar plexus. The ilio-inguinal

¹ See p. 162.

nerve lies upon the inner side of the internal saphenous vein, the genito-crural on the outer side, and the middle and external cutaneous nerves still more external. The superficial layer of this superficial fascia is continuous above with the superficial fascia of the abdomen, while the deeper layer is continuous below with the fascia lata a little below Poupart's ligament. Where it adheres to the saphenous opening in this fascia lata, it is pierced by small blood-vessels and lymphatics; hence the name *cribriform fascia* has been applied to it in this situation.



FIG. 8.—Femoral Hernia.

The *deep fascia* lying beneath the superficial fascia is called from its great extent the *fascia lata*. At the upper and inner side of the thigh, a little below Poupart's ligament and on the pubic side of its centre, is seen an oval opening directed obliquely downward and outward about an inch and a half in length and half an inch in width. This is the *saphenous opening*. To understand it properly the fascia lata may be described as consisting of two portions, *iliac* and *pubic*. The former "is attached externally to the crest of the ilium and its anterior superior spine, to the whole length of Poupart's

ligament as far internally as the spine of the pubes, and to the pectineal line in conjunction with Gimbernat's ligament, where it becomes continuous with the pubic portion. From the spine of the pubes it is reflected downwards and outwards, forming an arched margin, the outer boundary (superior cornu) of the saphenous opening. This is sometimes called the *falciform process* of the fascia lata or femoral ligament of Hey; it overlaps and is adherent to the sheath of the femoral vessels beneath; to its edge is attached the cribriform fascia, and it is continuous below with the pubic portion of the fascia lata by a well-defined curved margin."¹ The *pubic* portion attached above, to the pectineal line and internally to the margin of the pubic arch is upon the inner side of the saphenous opening, and at its lower margin is continuous with the iliac portion. We see therefore that the iliac portion "passes in front of the femoral vessels, the pubic portion behind them, while an apparent aperture exists between the two through which the internal saphenous joins the femoral vein."²

The outer margin of the saphenous opening forms a curved process, the falciform process of Burns, Burns' or Hey's ligament or femoral ligament. It curves inward upon its upper border to join Poupart's ligament, the spine of the pubes and pectineal line where it is continuous with the pubic portion. The inner margin of the opening is on a lower plane, lying behind the femoral vessels, and is less distinctly marked in its contour. When the limb is extended or rotated outward, the saphenous opening will be found tense and constricted; on the other hand, when the limb is flexed, or rotated inward, the opening is relaxed. So that this position of the limb is an important point to be borne in mind during the operation of taxis. (See page 214.)

¹ Gray.

² *Ibid.*

The triangle at the upper and anterior surface of the thigh where femoral Hernia makes its appearance is called Scarpa's. It is bounded above by Poupart's ligament, which forms the crural arch already described under inguinal Hernia, and which has a reflection at the pectineal line called Gimbernat's ligament. Externally this triangle is bounded by the sartorius and internally by the adductor longus, while its apex is formed by the meeting of these muscles.

Covered by the iliac portion of the fascia lata, and resting upon the pubic portion of the same fascia, is a continuation downward of the abdominal fascia, called the *femoral sheath*, the transversalis fascia passing in front of the femoral vessels and the iliac behind them. About an inch below the saphenous opening, the femoral sheath intimately blends with the vessels, but at Poupart's ligament it is much larger; hence it presents a funnel shape.

Besides the crural arch already described, we have the *deep crural arch*, which is a thickened band of fibres running across and in front of the crural or femoral sheath. "It is apparently a thickening of the fascia transversalis, joining externally to the centre of Poupart's ligament and arching across the front of the crural sheath, to be inserted by a broad attachment into the pectineal line behind the conjoined tendon." It is often altogether wanting.

By removing the anterior wall of the femoral sheath we see the femoral artery and vein separated by a thin septum; the artery being upon the outer side and the vein upon the inner. The interval between the vein and the inner wall of the sheath is filled only by loose areolar tissue and a few lymphatics; it is the *femoral or crural canal* through which femoral Hernia protrudes. It should be borne in mind by the dissector that this canal only exists as a distinct canal when distended by a Hernia or other tumour, or when artificially

separated in dissection. It varies in length from a quarter to a half an inch, and extends from Gimbernat's ligament to the saphenous opening. It is bounded *in front* by the transversalis fascia, Poupart's ligament, and the falciform process of the fascia lata, *behind* by the iliac fascia and the pubic portion of the fascia lata, on the *outer* side by the fibrous septum between the artery and vein, and on the *inner* side by the junction of the transversalis and iliac fascia, which cover the outer edge of Gimbernat's ligament. The lower opening of this femoral canal is the saphenous opening closed by the cribriform fascia, already fully described, while the upper opening is the *femoral* or *crural ring*, closed by the *septum crurale*. This septum crurale is a layer of condensed areolar tissue with its upper surface concave and separated from the sub-areolar tissue and peritoneum by a lymphatic gland. When this sub-areolar tissue has become infiltrated with a large amount of adipose tissue it may frequently be mistaken for the omentum, and lead one astray in his diagnosis. As the size and degree of tension of the saphenous opening is modified by the limb being flexed and rotated inward, so is the size and tension of the femoral canal likewise favourably influenced.

The *femoral ring*, like the canal, is an "artificial product" made by the descent of a femoral Hernia. It leads into the cavity of the abdomen, is of an oval form, measures about half-an-inch in its long, or transverse diameter, and is larger in the female than in the male; hence the more frequent occurrence of femoral Hernia in the former sex than in the latter.

In front it is bounded by Poupart's ligament and the deep crural arch, behind by the pubes, internally by Gimbernat's ligament, the conjoined tendon, the transversalis fascia, and the deep crural arch, externally by the femoral vein.

It is important to bear in mind that the spermatic cord and round ligament lie immediately above the anterior margin of the femoral ring, that the femoral vein lies upon the outer side of the ring, that the epigastric artery crosses the upper and outer angle of the ring, and that the obturator artery, instead of lying in its ordinary position on the outer side of the ring, occasionally "curves along the free margin of Gimbernat's ligament," and therefore runs along nearly the whole circumference of the ring.

The viscera in a femoral Hernia descend from the abdomen at first in nearly a perpendicular direction and lie in the hollow of the pectineus muscle. Covering the peritoneal sac is an investment named by Sir Astley Cooper the *fascia propria*. It lies "immediately external to the peritoneal sac but is frequently separated from it by more or less adipose tissue," and anatomically it is identical with the sub-serous cellular tissue already mentioned.

The protrusions of the hernial sac occur almost invariably on the inner side of the femoral vein. Cloquet, however, says, "The epigastric artery may be found on the inner side of the sac of a crural Hernia, the parts having descended in front of the femoral vessels;" and, together with Hesselbach, thinks this sufficient to warrant the division of femoral Hernia into internal and external. Besides these varieties, Cloquet also mentions a case where the Hernia "passed through an opening in the posterior part of the sheath, so that it lay immediately upon the pectineus and *behind* the femoral artery and vein." Such cases are however very rare; by far the greater number being of the internal variety.

To recapitulate. The femoral ring is situated *internal* to the femoral vessels, and is bounded as follows:—

Above (2 structures) { Poupart's ligament.
Deep crural arch.

Below	(4 structures)	{ Pubic bone. Pectineus muscle. Iliac fascia. Pubic portion of fascia lata.
Internally	(4 structures)	{ Gimbernat's ligament. Conjoined tendon. Deep crural arch. Transversalis fascia.
Externally	(2 structures)	Femoral vein and septum.

Going from the spine of the pubes outward, we meet the following in their order :—

- | | |
|--------------------------|---------------------------|
| 1. Gimbernat's ligament. | 4. Femoral artery. |
| 2. Femoral opening. | 5. Anterior crural nerve. |
| 3. Femoral vein. | |

The femoral canal, about half an inch long, extends from the femoral ring, where it is closed by the septum crurale, to the upper part of the saphenous opening, closed by the cribriform fascia, and is bounded as follows :—

In front	(3 structures)	{ Poupart's ligament. Fascia transversalis. Falciform process of fascia lata.
Behind	(2 structures)	{ Iliac fascia. Pubic portion of fascia lata.
Externally	(2 structures)	{ Femoral vein. Femoral septum.
Internally	(4 structures)	{ Fascia transversalis. Iliac fascia. Gimbernat's ligament. Deep crural arch.

Let us now look at the formations of a hernial sac.

The essential parts of a hernial tumour are three in number—

The sac.

The tissues enveloping the sac.

The contained viscus.

The sac is a prolongation of the peritoneum, and consists of the *mouth*, which is continuous with the abdomen; the *neck*, that portion of the parietes through which the sac protrudes; the *body*, which makes up the main bulk of the tumour, and the *fundus*, which is that portion of the body furthest from the abdomen. The neck undergoes many abnormal changes. It becomes thickened, discoloured, and opaque, from deposition of plastic adhesions, from irritation by a truss, or from a puckering of the sac consequent upon compression within the aperture from which it protrudes.⁹ It may, instead of being single, consist also of two constrictions representing the anatomical condition of the surrounding parts, while Gant mentions a large scrotal Hernia with three such necks.¹

The *body* varies greatly in different individuals, both in size and shape, being usually pyriform, but often globular, ovoidal, cylindrical, or constricted, like an hour-glass. It varies in size from a cherry to a tumour as large as a man's head. At first it is thin, but often, as in femoral, it becomes thickened and laminated in structure, although in umbilical Herniæ it is like to be thinned and atrophied, while in some rare cases there may be a fibrous or even calcareous degeneration of the component tissues.¹⁰

The formation of the sac varies in different Herniæ. The congenital hernial sac is found only in Inguinal Herniæ, and is a tubular prolongation of the peritoneum formed by the descent of the testicle, the natural fœtal opening of the tunica vaginalis not having been closed because of some abnormal condition. The formation of such a Hernia is rapid, occurs in infancy, and has only a single layer of peritoneal covering. The artificial

¹ The aperture may become altered too in shape, losing its triangular form, and becoming circular, and gradually with the lapse of time being displaced toward the middle line by the elongation of the peritoneum and the thickening of the transversalis fascia, so that the two rings become merged into one.

sac formed by the protrusion of a viscus through the abdomen by the stretching of the parietes, has been named by Birkett the "acquired sac." The formation of such a Hernia is gradual, and belongs only to middle and old age.¹

In some cases, as in internal and cæcal Herniæ, in cystocele, or in rupture of the sac, either from violence or ulceration, the sac may be absent. On the other hand, just as there may be two or more necks to a single sac, so there may be two sacs protruding through the same aperture, and forming a double Hernia. Indeed, Sir Astley Cooper mentions a case where six sacs occurred together in the same person.

Proceeding from without inward, and observing the coverings of a Hernia, we meet in Inguinal Herniæ the following tissues:—

Oblique.

1. Integument.
2. Superficial fascia, 2 layers.
3. Intercolumnar fascia.
4. Cremaster.
5. Fascia transversalis.
6. Sub-serous cellular tissue.
7. Peritoneum.

Direct.

1. Integument.
2. Superficial fascia, 2 layers.
3. Intercolumnar fascia.
4. Conjoined tendon (occasionally).
5. Fascia transversalis.
6. Sub-serous cellular tissue.
7. Peritoneum.

In femoral hernia the following are the coverings:—

1. Integument.
2. Superficial fascia.
3. Cribriform fascia.
4. Femoral sheath, or fascia profunda.
5. Septum crurale, or sub-serous cellular tissue.
6. Peritoneum.

Since the superficial fascia consists of two distinct layers, the coverings of Inguinal Hernia are generally considered to be eight, and those of femoral seven, in number.

The coverings of the hernial sac may undergo pathological modifications. The peritoneum is very tough and firm in texture, being able, according to Scarpa, to uphold a weight of fifteen pounds. It usually suffers little change, although it

¹ See p. 16.

may become thickened, opaque, and firmer near the abdominal opening, and may have serous or lymph effusions upon it.¹¹ The sub-serous cellular tissue often becomes thickened, exceedingly vascular, and fatty, so as greatly to resemble omentum, while the fasciæ and integument become stretched and, if a truss has been long worn, very much thickened and condensed. The fibrous and sub-cellular tissues covering old and long standing herniæ often become so blended together that it is impossible not only for the young student, but also for the skilled and practised dissector, to distinguish more than a single layer.¹²

The muscular fibres are, however, usually more distinct in their structure, and preserve their identity intact.

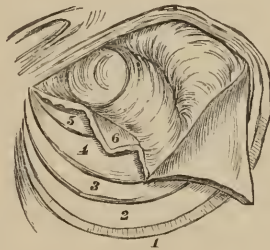


FIG. 2.—Coverings of Femoral Hernia. 1, skin; 2, superficial fascia, cribriform fascia; 3, crurale sheath; 4, femoral sheath; 5, septum crurale; 6, peritoneum.

Adhesions are commonly within the sac, and in long-standing cases, although often a hernia is rendered irreducible on account of fibrous adhesions to the tissues surrounding the rings. When the adhesions are within the sac, they may be between the coils of viscera, between them and the omentum, or between the contents and the walls of the sac. In recent cases these adhesions are soft and easily broken down, but in old cases they often become very firm and fibrous, and especially strong around the neck of the sac.

The symptoms of a reducible Hernia are as follows:—

There is a soft compressible swelling or tumour in the

abdominal parietes, or on the thigh, commonly in the groin, either above (inguinal) or below Poupart's ligament (femoral). This tumour enlarges, and is well marked when the patient stands, and still more so when he coughs or forces down. Coughing will moreover cause a distinct pulsation perceptible to the touch. When the patient assumes the recumbent position the tumour diminishes, and can be reduced by proper manipulation in the direction of its protrusion. The tumour is like to be larger after a meal, and the patient to suffer from flatulence, grumblings in intestines, and other inconveniences resulting from the difficulty of passage of matter through the protruded intestines. There is usually no other pain or sign of inflammation. The hernial tumour, if it attains any considerable size, becomes pendulous, hanging in scrotal and umbilical herniæ even to the knees. Such herniæ may at any time be made irreducible by blows or pressure, by improper manipulation, by the application of a truss when the hernia has not been fully reduced, or by undue violence in taxis. Oftentimes, although the intestine can be readily restored to its normal position, the sac remains protruding because of adhesions which have formed. Further manipulation is then of no avail, and may produce a severe inflammation. Although it has been sometimes recommended to confine these tissues in the aperture of the rings in order to excite adhesive inflammation for the support of the Hernia, such methods have usually been fruitless in results except in young children.

The presence of fluid in the hernial sac will be almost certain to obscure the visceral nature of the contents of an epiplocele or of an entero-epiplocele so as to simulate an enterocele. Hydrocele of the cord may also lead us far astray in our diagnosis of a Hernia as the following case will show.

A little boy with a congenital oblique inguinal suffered at the age of five a strangulation. Dr. J. Leonard, an old friend of

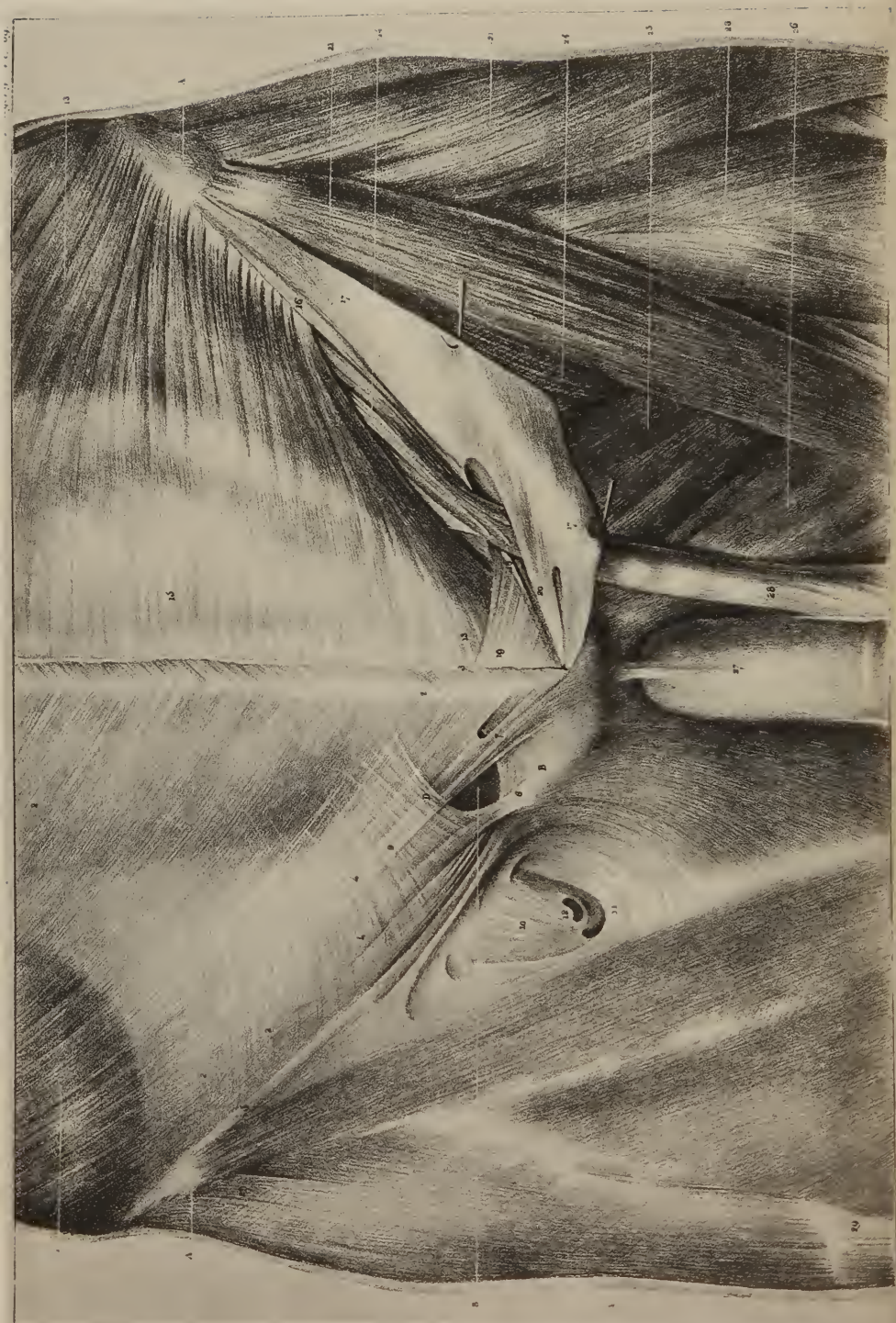


PLATE B.

ANTERIOR PARIETES OF THE TRUNK.

By BOURGERY.

Details of the Inferior Part of the Great and Small Oblique Muscles, and of their relations with the Groins and the Origin of the Thighs.

Right side of Subject: Great oblique and femoral aponeurosis.

Left side: Small oblique, and superior part of the muscles of the thigh.

EXPLANATION OF THE PLATE.

A, A. Anterior and superior ridges of the bones of the ilcs.

RIGHT SIDE.

B. Ridge of the pubis.

1. Inferior muscular fibres of the great oblique.

2, 2, 2. Aponeurosis of the same muscle.

3, 3. Section of the aponeurosis upon the white line.

4, 4. Ligamentous small bands for strengthening, which form at their extremity the pillars of the inguinal ring.

5, 5. Fold of the aponeurosis, or Poupart's ligament.

6. External pillar of the inguinal canal.

7. Its internal pillar intercrossed upon the pubis with that of the opposite side. More within there is a vascular aponeurotic slit.

8. Opening of the inguinal ring.

9, 9. Oblique fibres arising from Poupart's ligament, which, crossing the direction of the aponeurosis, close above the opening of the ring, and, together, bind its two pillars.

10. Superficial leaf of the fascia-lata aponeurosis, in front of the crural canal.

11. Falciform fold of the aponeurosis, forming the free edge of the inferior orifice of the same canal.

12. Section of the saphenous vein which passes through this orifice.

LEFT SIDE.

From 13 to 13. Inferior muscular fibres of the internal oblique muscle.

14. Arcade, formed above the cord of the spermatic vessels by the last fibres, of which some detach themselves in order to concur to the formation of the cremaster muscle.

15. Aponeurosis of the small oblique muscle.

16, 16. Gutter of Poupart's ligament.

17, 17. Aponeurosis of the great oblique inverted.

18. External pillar.

19. Superior tie of Poupart's ligament, or internal inguinal ligament.

20. Internal pillar. Between the two pillars, the opening of the inguinal ring, crossed by the spermatic vessels, is seen. Above the internal pillar is the aponeurotic slit indicated on the other side.

21. Sartor muscle.

22. Fascia lata.

23. Anterior right of the thigh.

24. Bundle of the psoas and iliac.

25. Pectineus.

26. First abductor.

27. Penis.

28. Cord of the spermatic vessels.

29. (Right side): Fascia-lata aponeurosis, under the insertion of the same name.



mine, succeeded in reducing the strangulation after long efforts, although he told the parents that to his mortification he had so enlarged the hernial rings, that the hernia could not be retained in the abdomen although he knew he had reduced it. The fact was, as I have since learned by personal examination, the boy was suffering from hydrocele as well as strangulated Hernia and the parts were dilated not so much by the doctor's manipulation as by the pressure caused by the effusion in the hydrocele.

Since the symptoms of many other varieties of tumours so closely resemble hernial tumours, it will be necessary to distinguish accurately between them in order not to be misled in our diagnosis. In surgical practice we have to distinguish between the two forms of Inguinal Herniæ, direct and indirect; between Inguinal Hernia and the following conditions :—

Femoral Hernia.	Varicocele.
Hydrocele of the cord.	Hæmatocele.
Hydrocele of testicle.	Bubo.
Sarcocele of testicle.	Impacted fæces.
Undescended testicle.	

We have also to distinguish between femoral Hernia and enlarged glands.

Psoas abscess.
Varix of saphenous vein.
Lipoma of femoral canal.

Ventral Herniæ may be confused with Umbilical, Thyroid with Perineal, Diaphragmatic Herniæ with Mediastinal Tumours, Congenital Herniæ with Hydrocele, and with Infantile or Encysted Herniæ.

To make clear the different points of distinction between these various conditions, I have thought it best to arrange in tabular form the following differential diagnosis.

No. 1.]	Shape. Colour : Translucency.	Location, Weight, Size.	Advent and Development.	Percussion and Auscultation.	Palpation.	Cough Impulse and Fluctuation.	Inguinal Canal.	Spermatic Cord.	Bowel.	Reduction.	Addenda.
Indirect Inguinal Hernia.	Flask-shaped.	Frequently scrotal and often very large.	Advent Sudden.	P. Resonant.	Soft and doughy. (Enterocoele).	Present.	Filled.	Usually con- cealed behind neck of sac.	Possible	Pressure outward and backward. Usually reducible.	Pulsation of deep epigas- tric artery concealed.
Direct Inguinal Hernia.	Globular.	Seldom scrotal and usually small.		P. Flat.	Hard when it is epiplocele.		Empty.	Outside of the neck as a rule.	Pressure directly backward.	Pressure directly backward.	Epigastric often felt pul- sating outside the neck.
Scrotal Hernia.	Smooth and regular. Flask-shaped.	Scrotum. Weight : light.	Sudden.	P. Usually resonant. A. Gurgling.	Soft and doughy.	Present in majority of cases.	Usually filled.	Concealed & displaced by neck of sac.	Occasional embarrass- ment.	Pressure back- ward & outward uniting strangu- lated, increas- ing, and irreducible.	Seldom painful unless inflamed or strangulated.
Sarcocoele.	Often nodular and irregular in outline.	Testicle. Weight : heavy.	Grows slowly as a rule.	P. Dull or flat. A. Negative.	Hard and resistant.	No impulse.	Empty.	Surrounds the cord.	Never affected.	Irreducible.	Frequently painful.
Scrotal Hernia.	Flask-shaped. Opaque.	Scrotum. Weight : light.	Develops suddenly from above downward.	P. Resonant.	Soft and doughy.	Fluctuation absent.	Filled except when direct Hernia enter scrotum.	Usually con- cealed by neck of sac.	May be embarrassed	Usually reducible.	Aspiration negative.
Hydrocoele of Testicle.	Pyriform or ovoid. Translucent.	Tunica vaginalis. Testis.	Develops slowly from below upwards.	P. Dull or flat.	Hard, tense, and elastic.	Fluctuation well marked.	Empty.	Neither con- cealed nor displaced.	Never affected.	Never reducible.	Fluid withdrawn by aspiration or tapping.
Scrotal Hernia.	Smooth and regular outline Colour : normal.	Scrotum on either side. Weight : light.	Develops suddenly.	P. Usually resonant.	Smooth on surface.	G. I. Usually present. F. Absent.	Usually filled.	Concealed and displaced.	May be embarrassed	Reducible by taxis only.	Effect of heat : negative. Return of tumour pre- vented by pressure at external ring.
Varicocele.	Knotty and irregular. Colour : bluish.	Most frequent on left side. Around spermatic cord.	Develops gradually.	P. Dull.	Feels like a bag of worms.	C. I. None. F. May exist if vessels are large.	Uninvolved.	Not affected.	Never affected.	Often reduces spontaneously when position in standing position in- creases. Tumour returns in spite of pressure at the ring.	Effect of heat : tumour in- creases. Tumour returns in standing position in- spite of pressure at the ring.
Scrotal Hernia.	Flask-shaped, unless due to direct Hernia. Colour : normal.	Scrotum. Weight : light.	Develops suddenly from above downward.	P. Usually resonant. A. Gurgling.	Soft and doughy.	F. Never present.	Usually filled.	Concealed and displaced.	May be embarrassed	Usually reducible.	No constitutional symp- toms except when strangulated or severely inflamed.
Hematocoele of Testicle.	Pyriform. Integument is ecchymotic.	Tunica vaginalis. Testis. Weight : heavy.	Suddenly if of traumatic origin; slowly if sponta- neous. Grows from below upward.	P. Dull or flat. A. Negative.	Soft at first but hard after conglutination occurs.	F. Always present until conglutination occurs.	Empty.	Not affected.	Never affected.	Irreducible.	Pallor : Great prostration often present from loss of blood.

No. 2.]	Location. Weight, Size.	Advent and development.	Percussion and Auscultation.	Cough Impulse and F fluctuation.	Bowel.	Reduction.	Addenda.
Femoral Hernia	Often felt deep in groin. Movements restricted.	Usually due to some severe muscular effort.	P. Resonant. A. Gurgling.	C. I. Present on flexion and adduction of thigh with body bent forward. F. Never present.	Often embarrassed.	Reduced by pressure downwards, backwards, and upwards.	Tumour always solitary. Rare in the male sex.
Enlarged gland.	Always superficial. Great mobility.	Scrofulous diathesis.	P. Flat. A. Negative.	C. I. None. F. Often detected.	No embarrassment.	Irreducible.	Tumour seldom solitary. Equally frequent in both sexes.
Femoral Hernia	Neck of sac lies internal to femoral artery.	Usually due to severe muscular effort.	P. Resonant.	F. None.	Intestinal derangement often present.	On pressure downwards, backward, and upward. Distinct and sudden disappearance with gurgling.	Pain frequently absent. Tumour remains reduced in recumbent position.
Psoas abscess.	Neck of sac external to femoral artery.	History: Spinal disease or pelvic affection.	P. Dull or flat.	F. Often occurs if tumour is superficial.	Bowel acts normally.	Disappears gradually on direct pressure. No gurgling.	Pain in back or loins always precedes development. Tumour returns after removal of pressure.
Femoral Hernia	Directed obliquely across the thigh. Usually small.	Severe muscular effort.	P. Resonant. Often exists.	C. I. Present on flexion and adduction of thigh with body bent forward.	Often embarrassed.	By pressure downward, backward, and upward with a sudden slip and gurgle.	Tumour usually hard and tense: may be doughy. Skin of normal colour. Return of reduction prevented by pressure over femoral ring when patient is standing. Heat has no effect on size.
Varix of saphenous vein.	Lies in longitudinal axis of limb. Variable in size.	History and increased size of veins below crural ring.	P. Flat.	C. I. Often absent but may exist.	No embarrassment.	Reduction gradual by direct pressure in recumbent position. No gurgle.	Soft and indistinctly fluctuating, often discoloured. Tumour returns when patient stands in spite of pressure at femoral ring. Increased by heat.
Femoral Hernia	Small and well-defined in outline.	Advent sudden.	P. Resonant. May exist.	C. I. Often detected with thigh flexed and adducted and body bent forward.	Intestinal embarrassment not infrequent.	Usually reducible.	Tumour often hard. Symptoms in common. Tumour in upper part of the thigh, " inside of femoral vessels, " external to pubic spine, " below " " Tumour always doughy.
Lipoma of femoral canal.	Not well-defined in outline. May be large.	Develops slowly.	P. Dull.	C. I. Never present.	Bowels not affected.	Irreducible.	
Femoral Hernia.	Neck below Poupart's ligament. Usually small and round.	Spermatic cord. Internal to and in front of neck of sac.	P. Frequently dull.	Femoral pulsation. Felt external to neck when finger is in the canal.	Spine of pubes. Internal to neck of sac.	By pressure downward, backward, and upward.	Tumour if elongated lies obliquely across the thigh and never enters scrotum and labia.
Inguinal Hernia.	Neck above Poupart's ligament. Often very large and flask-shaped.	External and behind neck of sac.	P. Resonant.	Finger in the Femoral canal detects no pulsation.	External to neck of sac.	Indirect: By pressure outward and backward. Direct: By pressure directly backward.	Tumour if elongated is often scrotal in situation.

No. 3.]	Location.	Advent and Development.	Reduction.	Age.	Neck of tumour and appearance.	Palpation.	Navel.
Ventral Hernia.	Most frequent between rectum and umbilicus of abdomen.	Never congenital. History: Traumatism, abscess or weakening of abdominal walls.	Often somewhat difficult.	May occur at any age.	Neck is well-defined.	Edges of opening in abdominal walls can be felt.	Present and in normal position.
Umbilical Hernia.	Bulging at the navel. Navel therefore absent.	Often congenital. History of traumatism or abscess <i>acuturn</i> present.	Effected by mere pressure.	Most frequent in infants.	No apparent neck, but only a bulging at the navel. Usually spherical.	No unnatural opening can be detected.	Absent: tumour supplies its place.
Thyroid Hernia.	In the thigh near the inferior commissure of vulva. Seen in male sex.	Sudden.	Reducible.	Occurrence.	In the old and emaciated neck is felt from outside the body. In obscure cases a vaginal or rectal exploration is necessary.	Symptoms in common.	
Perineal Hernia.	Perineum above rectum. In both sexes.			Often impossible to detect when small.	Not discernible unless protrusion is extensive and involves perineum. Often easy to decide if tumour is pronounced.	Sudden advent. Resonant percussion. Reducibility. Gargle impulse as a rule. Possible intestinal embarrasment.	
Diaphragmatic Hernia.	Passing through diaphragm.	Sudden advent of protrusion into the thorax known to the patient.	May possibly be reduced by manipulation and position.	Pericussion.	Auscultation.	Thirst.	Peritonitis.
M. diastinal Tumours.	High up in the thorax.	No marked or sudden symptoms until the size creates pressure.	Irreducible.	Tympanitic or localized dullness low down in the diastnum or thorax if hernia is superficial.	Gurgling.	May be extreme.	Symptoms rapid if tumour is extensive.
Congenital Hernia.	Inguinal canal distended and involved.	Occurrence sudden. May suddenly increase when once developed.	When fluid portion is reduced it reveals a concealed testicle, which also reduces with gurgling and peculiar sensation of sickness.	Localized dullness.	Negative. If aneurism exists a bruit is heard.	Extreme thirst is absent.	Never produced
Hydrocele.	Inguinal canal empty.	A ways developed slowly and gradually.	Irreducible.	Age.	Petiole.	Translucency.	Inguinal canal.
Congenital Hernia.	May occur anywhere but here we consider only the serotal variety.	When in serotum, is found before the tunica vaginalis closes after descent of testicle.	After reduction of fluid and intestinal portion the testicle appears. This is also reduced with gurgling and pain.	Usually in infants. Subsequent attacks may occur in adults.	Globular.	Usually fluctuating at upper part.	Either distended or involved.
				Any age. Not necessarily associated with previous attack.	Marked.	Marked at all points.	Empty.
				Age.	Pyiform.	None.	Translucent.
				Never attacks adults unless a previous attack has existed in infancy.	Fluctuation.	Marked at all points.	Translucent.
				Most common in infants, but may occur at any age.	Exists at upper part of tumour from presence of peritoneal fluid.		Translucent at upper portion.
Infantile		Occurs after e'curre	Reduction of tumour		Absent.		Opaque.

No. 4.]	Location.	Advent and Development.	Resonance and Auscultation.	Palpation.	Cough Impulse and fluctuation.	Bowel.	Pain.	Reduction.	Adenda.
Incomplete Inguinal Hernia.	Confined to limits of inguinal canal. Outlines often indistinct.	History of muscular strain usually present.	P. Frequently resonant. A. Gurgling.	Usually soft.	C. I. Often detected. F. Absent.	May be embarrassed.	Generally <i>painless</i> .	Possibly and often easy.	Edema absent. Constitutional symptoms absent unless sac be strangulated or inflamed.
Bubo.	Often diffused beyond the limits of the canal. Outline usually clearly defined.	Venereal origin often detected.	P. Dull. A. Negative.	Hard at onset.	C. I. Usually absent. P. Present if suppuration occurs.	Unaffected.	Generally <i>painful</i> .	Impossible.	Edema present. Frequent constitutional symptoms.
Bubonocoele.	Small and inguinal canal.	May be sudden.	P. Frequently resonant. A. Gurgling.	Usually soft.	C. I. Common to both.	May be embarrassed.	Generally <i>painless</i> .	Reduction with a gurgie.	Vomiting. Scrotum normal and both testicles present.
Undescended Testicle.			P. Dull or flat. A. Negative.	Hard like a gland.		Unaffected.	<i>Very</i> painful. Pressure causes characteristic sensation of sickness.	May be impossible. No gurgie.	Vomiting. Scrotum imperfect on side corresponding to tumour and testicle wanting.
Inguinal Hernia.	Felt only in inguinal region.	Developed <i>suddenly</i> after strain or injury.	P. Usually resonant.	Usually soft.	C. I. Frequent. F. None.	May be associated with <i>obstinate</i> constipation.	Usually <i>painless</i> .	Pressure may effect reduction.	untill, absent unless hernia be strangulated or inflamed. Not sensitive unless strangulated or inflamed.
Impacted Faeces.	Felt at the side as well as in inguinal region.	Developed <i>slowly</i> with colic pains and no apparent causation.	P. Flat.	Hard and nodulated.	C. I. Absent. F. Present.	Always associated with <i>obstinate</i> constipation.	<i>Painful</i> .	Localized pressure causes induration.	Vomiting usually present. Always tender on pressure in advanced stages.
Inguinal Hernia.	Frequently scrotal and generally diffused.	Sudden and from above downward.	P. Resonant, as a rule. A. Gurgling.	Soft as a rule. Opaque.	C. I. Frequent. F. None.	Often embarrassed.	Usually <i>painless</i> .	Reduces with a gurgie.	Movements of testicle have no effect. Reduction remains while recumbent position is maintained.
Hydrocele of Cord.	Circumscribed in limits.	Slow unless produced by violence. Occurs from above downward.	P. Dull. A. Negative.	Tense. Often translucent.	C. I. Absent. F. Present.	Never embarrassed.	Usually <i>painless</i> .	Usually irreducible. If reduced, no gurgie.	Movement of testicle transmits an impulse to the tumour. Return of reduction irrespective of position.
Enterocele.	In all forms of herniae.	Advent sudden, with <i>acute</i> pain.	P. Usually resonant.	Soft, compressible, elastic.	C. I. Distinct.	May be embarrassed.	Frequently absent.	Sudden return with gurgling.	
Epiplocele.	Rare in Femoral.	Advent slower, with <i>dull</i> pain.	P. Flat.	Doughy, hard-r, inelastic, and lobulated.	C. I. <i>Less</i> distinct.	Unembarrassed unless we have Entero-epiplocele.	More painful.	Reduced <i>slowly</i> in a lump with no gurgling.	

The following diagrams illustrating the different forms of Hernia with some of the complications, are taken from my distinguished friend Thomas Bryant's highly esteemed work on Surgery, by his according me free permission for the use of this work. The same permission is granted by my no less distinguished friend Mr. J. Wood.

In all these diagrams the thick black line represents the parietes covering the hernial sac; the thin line the peritoneum and hernial sac; the small body at the bottom of the sac the testicle.



FIG. 10.



FIG. 11.



FIG. 12.

FIG. 10.—This diagram illustrates the tubular vaginal process of peritoneum open down to the testicle, into which a hernia may descend. When the descent occurs at birth the hernia is called "congenital;" when at a later period of life the "congenital form." Birkett's "hernia into the vaginal process of peritoneum," or Malgaigne's "hernia of infancy."

FIG. 11.—The same process of peritoneum open half-way down the cord, into which a hernia may descend at birth or at a later period. Birkett's "hernia into the funicular portion of the vaginal process of the peritoneum."

FIG. 12.—The same process undergoing natural contraction above the testicle, explaining the hour-glass contraction met with in the congenital form of scrotal hernia as well as in hydrocele.



FIG. 13.



FIG. 14.



FIG. 15.

FIG. 13.—Diagram showing the formation of the "acquired congenital form of hernia," the "encysted of Sir A. Cooper," "the infantile of Hey," the acquired hernial sac being pushed into the open tunica vaginalis which encloses it.

FIG. 14.—Diagram illustrating the formation of the "acquired" hernial sac, distinct from the testicle or vaginal process of peritoneum which has closed.

FIG. 15.—Illustrates the neck of the hernial sac pushed back beneath the abdominal parietes with the strangulated bowel. See Figs. 19 and 20.



FIG. 16.



FIG. 17.



FIG. 18.

FIG. 16. — Shows the space in the subperitoneal connective tissue into which intestine may be pushed through a rupture in the neck of the hernial sac, the intestine being still strangulated by the neck. See Fig. 21.

FIG. 17. — Diagram showing how the neck of the vaginal process may be so stretched into a sac placed between the tissues of the abdominal walls, either upwards or downwards, between the skin and muscles, — muscles themselves or between the muscles and the internal abdominal fascia, — forming the intra-parietal, inter-muscular or interstitial sac, *hernia en bissac* of the French, “additional” sac of Birkett. See Fig. 22.

FIG. 18. — Diagram illustrating the reduction of the sac of a femoral hernia *en masse* with the strangulated intestine. First variety of displaced hernia.

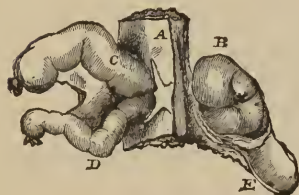


FIG. 19.

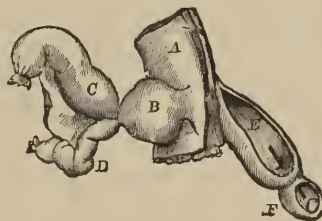


FIG. 20.

Drawing illustrating the second varieties of displaced hernia.

FIG. 19.

A A portion of abdominal muscles, with the peritoneal lining.

B The strangulated fold of intestine.

E The testicle.

The dark lines at the neck of the sac represent the duplicature of the peritoneum, which being unfolded formed a sac for containing the intestine when reduced.

FIG. 20.

A. Peritoneum lining the abdominal parietes.

B. The tumour formed when the strangulated intestine was pushed through the spermatic canal into the sac formed by peritoneum in the inside.

C. The superior portion of the intestine.

D. The inferior.

E. The scrotal hernial sac.

F. The testicle, with the vaginal coat opened. See also Fig. 15.

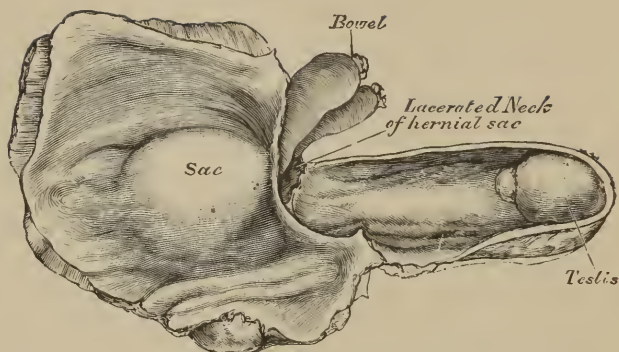


FIG. 21.—Third variety.

Interstitial hernia, with ruptured neck of hernial sac. See also Fig 16.

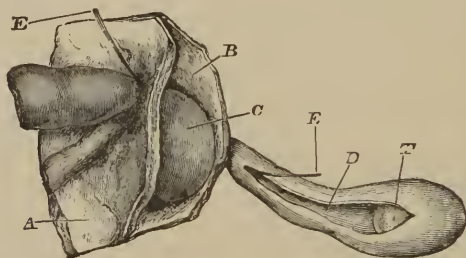


FIG. 22.—Drawing illustrating the fourth variety or intra-parietal form of displaced hernia

- A. Peritoneum lining the abdominal muscles (B).
- C. Intra-parietal sac with strangulated bowel.
- D. Scrotal hernial sac leading down to testicle (T).
- E. Director passed from the congenital scrotal sac through the internal ring.

In the drawing the strangulated bowel has been introduced to make the description clearer.
See also Fig. 17.

CHAPTER IV.

STRANGULATED HERNIA.

A HERNIA is said to be strangulated when not only the passage of fæces is impeded by the constriction, but also the circulation of the blood. The varieties of Hernia in which strangulation is most violent and severe are the femoral and incomplete inguinal, since they are small and therefore apt to be overlooked.

A large and long standing Hernia is more liable to strangulation than a large and recent one, but a small recent Hernia is still more liable to strangulation than one of longer standing. Sir Astley Cooper says, "A small Hernia is more easily strangulated than a large one, the pressure on the contents being more violent and the symptoms much more urgent, as the stricture acts with much more effect upon a single knuckle in stopping its circulation, than when the contents of a Hernia are large and voluminous." On the other hand it must be borne in mind that of Herniæ of the same size, an old one is more liable to strangulation than a recent one, although in the latter the symptoms are more dangerous and likely to be attended with mortification of the intestine.

Is this condition of strangulation solely the result of a mechanical constriction, or is it partly the result of some pathological change set up in the intestine before protrusion? Birkett feels justified from the symptoms preceding the constriction, "in attributing the strangulated state of a Hernia to

a predisposing cause, commencing in a morbid state of the alimentary canal generally; at least in some cases." The patients have usually complained for some time of a disordered or relaxed state of the bowels, and it is also found that the entire mucous surface of the small intestines secretes more than a normal amount of their fluid, and that the intestines are greatly distended and congested.

Erichsen on the other hand gives a slightly different ætiology of the Hernia. He thinks it induced by the constriction to which the intestines are subjected, producing stagnation of blood and inflammation of the congested part.

The *stricture* is most commonly outside the neck of the sac in the tendinous structures surrounding it, although sometimes at the neck itself, and more rarely around the body of the sac, thus giving a Hernia shaped like an hour-glass. It takes place suddenly and usually in consequence of some violent muscular exertion.¹³

1. What is the condition of a Strangulated Hernia?

2. What changes take place in it?

3. What are the symptoms excited in the constitution, and the morbid conditions in the abdomen?

1. The first condition of strangulation is that the blood is impeded, and next that it is arrested. The tissues of the bowel become swollen, they are solid and leathery, their colour dark purple often mottled with red. This inflammation causes a flow of lymph into the intestines giving then a rough and villous appearance.

When the bowels have been some hours strangulated their tissues become soft, the serous surface has lost all its normal characteristics, it is black and adhesive, gangrene has now set in. This state usually comes on within twenty-four hours, although it may come on in a very few hours or may be delayed for forty-eight hours. The intestine becomes firmly fixed to

the mouth of the sac by adhesions, the omentum becomes dark purple, and there is usually a large quantity of turbid serum in the sac. If the strangulation is unrelieved, gangrene of the skin may take place, and the faecal matter may be discharged through the disintegrated tissues. Such a state is somewhat rare, and it is often the case that there is no external evidence that gangrene has attacked the intestines.

2. As a result of the gangrenous inflammation an artificial anus may be formed in two ways; one in which only a hole is corroded through the alimentary canal without interfering with its continuity, the other "due to an ulceration of all the coats of the bowel even to the mesentery," and therefore "interfering with the continuity of the bowel."¹

The coverings of the hernial sac undergo pathological modifications due to ecchymoses, inflammations,¹ oedema &c. The tumour may become very sensitive and excruciatingly painful; it may also become swollen, from infiltration of serum, tense and regular in outline.

"The discoloured parts become cold and insensible, and more and more dark except at their borders which are dusky red; a thin, brownish, stinking fluid issues from the exposed integuments; gas is evolved from similar fluids decomposing in the deeper-seated tissues, and its bubbles crepitate as we press them; At the borders of the dying and dead tissues, if the mortification be still extending, these changes are gradually lost; the colours fade into the dusky red of the inflamed but still living parts; and the tint of these parts may afford the earliest and best sign of the progress toward death or the return to a more perfect life. Their becoming more dark and dull, with a browner red, is the sure precursor of their death; their brightening and assuming a more florid hue is as sure a sign that they are more actively alive."²

¹ See Chapter XI.

² Paget, *Surgical Diagnosis*.

Another appearance of mortified parts, characteristic of a class, is presented after they have been strangulated. I have mentioned the difference which in these cases depends on whether the strangulations have been suddenly complete, or have been gradually made perfect. In the former case the slough is very quickly formed, and may be ash-coloured, gray, or whitish, and apt to shrivel and become dry before its separation. In the latter case as best exemplified in Strangulated Hernia, the blood vessels become gradually more and more full, and the blood grows darker till the walls of the intestine, passing through the deepest tints of blood colour and of crimson, become completely black. Commonly, by partial extravasation of blood and by inflammatory exudation they become also thick, firm, and leathery, a condition which materially adds to the difficulty of reducing the Hernia, but which is generally an evidence that the tissues are not dead; for when they are dead they become not only duller to the eye, but softer, more flaccid and yielding, and easily torn like the rotten tissue of other mortified parts. The canal which was before cylindrical may now collapse; and now commonly the odour of the intestinal contents penetrates its walls.

I have said the serum might be turbid. It also becomes brownish yellow with the odour of fæces and before bursting though the walls of the intestine may infiltrate its tissues or coverings.

3. One of the first and main symptoms of strangulation is nausea in the morning after rising from bed, with vomiting due to a nervous irritation upon the viscera. As soon as the strangulation has taken place the patient feels restless and uneasy, a feeling of tightness is felt as though a band were bound around the body. In general, the symptoms are those of obstruction. Around the seat of constriction there is acute pain, often increasing so as to resemble the severe pains of peritonitis.¹⁴ As a

result of the stoppage of peristaltic movements, complete constipation, severe and continuous vomiting together with violent retching, first ejecting the contents of the stomach and then faecal matter, and colic pains ensue. When the symptoms of peritonitis have appeared, the pulse is quick and hard, the mouth dry, surface of body hot and head racked with pain. The countenance assumes the peculiar shrunk aspect called by the name of Hippocrates, the extremities are cold, the mind is clouded with delirium, and when gangrene has set in hiccough comes on with a sudden cessation of pain. This symptom of hiccoughing is regarded as an especially unfavourable symptom. The period at which death takes place varies from three to five days, being earlier in small and recent than in large and long standing Herniæ.

It is worthy of notice that strangulated omental Hernia has symptoms resembling strangulated intestinal Hernia, only they are less severe; they lead however to the same result—fatal peritonitis.

As in reducible so in strangulated Hernia there is need of a differential diagnosis. It may be confused with *ilius* but may be distinguished from it because in general the patient can tell the state of his bowels, there will be the history to help us and if we are to deal with a Hernia we can always with more or less search find a tumour. It may be confused with an *obstructed irreducible Hernia* but distinguished from it because the latter is not tender to touch and has no peritonitis. Although there may be constipation there is no vomiting as there is in strangulated.

From an *inflamed irreducible Hernia*, because in it there is no vomiting and because the constipation is not entire, liquid fæces usually passing.

From *general peritonitis conjoined with Hernia*, because in it the peritonitis is not confined to the region of the sac, because

what little vomiting there is does not bring up fecal matter and because the constipation is not entire.

With *double* Hernia, one may be strangulated and the other not; the strangulated one will be the more tender about the neck of the sac, and thus we can determine in which the constriction lies.

Displaced Herniæ. — There are four varieties. The first applies only to femoral herniæ, the other three only to inguinal.

First. The strangulated hernia with its sac may be bodily reduced within the abdominal ring and behind the abdominal parietes. This is the true reduction *en bloc* or *en masse* of French writers and of Luke. See Fig. 18. Cases are rare.

Second. The neck of the sac becomes detached from the internal ring and pushed upwards beneath the abdominal walls, so that the intestine is strangulated by the orifice of the sac. See Figs. 15, 19, and 20. The two latter drawings are the original ones of Sir Charles Bell, and first appeared in the *Medical Gazette* in 1828. A clinical report upon such a case may be found on p. 352.

Third. This is an interstitial form with a ruptured or lacerated neck of the hernial sac. "The delicate serous membrane of the sac is rent or torn, and the hernia makes its escape through the aperture into the subserous connective tissue, as the effect of forcible or long sustained compression of the hernial tumor. Its course outside the peritoneal sac is advanced by continued pressure, and, detaching the connections of the neighboring peritoneum, it forms for itself a pouch between that serous membrane and the internal abdominal fascia." See Figs. 16 and 21. This form is more common in the congenital variety of hernial sac, and occurs at the posterior part of the neck.

According to Birkett, the indications of the accident are as follows: The tumor becomes flaccid, and therefore smaller. The bulk of the tumor slowly diminishes as the pressure is continued,

until at last very little, if anything, can be felt; but still the surgeon has failed to experience that sudden jerk so characteristic of the escape of the hernia from the gripe of the mouth of the sac. After the effects of the chloroform have passed away, all the symptoms of strangulated bowel recur, and perhaps with increased force. Even the tumor itself may reappear and recede on the application of slight pressure. When such a condition is found, the hernial sac must be exposed and opened. It may appear empty, and the finger may enter the cavity through a well-defined abnormal aperture, which may be mistaken for the internal ring and the cavity of the abdomen. This would, however, lead to a fatal error, and one which would surely compromise the life of the patient. Two orifices will be found; one dipping into the artificial sac, the other dipping into the abdominal cavity. If the bowel does not come forth spontaneously, an effort must be made to draw it out, and then the true mouth of the sac will be discovered by passing the finger upward along the anterior surface of the mesentery.

The protrusion is firmly constricted by the orifice of the hernial sac. This constriction must therefore be cut, "after which operation the exercise of great care and caution is needed to prevent the entrance of the hernia once more into the abnormal space outside the peritoneal cavity. As the salvation of life depends upon the return of the protrusion through the natural orifice of the sac, considerable freedom in the use of the knife is justifiable." An interesting case, reported March 8, 1881, by Dr. E. Mason, of New York, will well illustrate this form of hernia, and may be found on p. 352.

Fourth. This consists of an *intermuscular* or *interstitial* or *intraparietal* sac, with a herniated neck, and is almost always associated with a congenital form of hernia. The sac is usually found between the abdominal muscles and abdominal fascia, although sometimes between the external oblique and the skin.

See Figs. 17 and 22. Anatomically, it consists of two parts; that which passes along the inguinal canal into the scrotum, and that which is lodged in the wall of the abdomen. Scarpa and Fano have recorded cases. See also on p. 354 a case reported by Dr. Shrady, February 4, 1881. When the hernia is strangulated by the ventral orifice of the sac, and when it occupies the scrotal division, it may, unless very great care is used, be pushed by taxis into the other side, so that the tumor disappearing, the surgeon thinks the hernia reduced. The symptoms, however, very quickly show that this is not the case.

Birkett offers the following explanation for many of these cases. "The tissues of the scrotum are very loose, and readily change their position. Both the spermatic cord between the external abdominal ring and the hernial sac attached to the anterior surface of the spermatic cord vary in length. When the hernia occupies the sac, the latter extends lower than when it is empty. Now let its mouth and neck be detached from the internal abdominal ring, and the hernia, still strangulated by the margins of the orifice, be pushed inside the abdominal walls. The fundus of the sac attached to the tissues of the scrotum is not on this account severed from these connections, but merely ascends toward the inguinal canal, and lies partially within it, with its walls in close contact, which, being rather thin, are not recognizable."

All these forms of displacement are indicated by the disappearance of the tumor without the characteristic jerk, and by the persistence of the symptoms. The treatment in all is the same as that described under the third form.

CHAPTER V.

OPERATIONS FOR HERNIA.

"The radical cure of Hernia would be too important a triumph for surgery and a resource too deeply interesting to humanity to permit that we should not endeavour to improve it still more and to modify its processes and to make renewed efforts for the purpose of attaining this result. For myself I cannot cease to entertain the idea that in the experimental spirit of our age we may succeed in obtaining a remedy of this description which shall be of real efficacy."—VELPEAU, *Operative Surgery*.

IN this brief and necessarily imperfect sketch of the various operations that have been or are now used for the relief and cure of Hernia, I have thought it best to insert without material alterations a paper prepared by me and read before the Vermont State Medical Society, June 15, 1880. With this brief explanation I trust the reader will kindly pardon any peculiarities of expression that may have crept into an essay intended to be delivered in an assembled meeting of medical gentlemen.

As many of you are aware, I have written of late much upon the radical cure of Hernia, which has been received by the medical press and profession with no little interest. I therefore take the present opportunity to say that I do not like the term *radical* when applied to this or any other surgical operation. To me it sounds unprofessional, contrary to all my ideas of professional propriety and detrimental to the fair name of medical and surgical science. I know that some of the most honoured men that have brightened the pages of surgical litera-

ture or that have taught in our universities of medicine have thus denominated many of the operations that have been devised for the treatment of Hernia. The term has been more extensively used, however, by those who are not of the regular profession and whose ideas of professional etiquette are not models for us to pattern after. I can but think then that in our present progress of the healing art, it would be out of harmony with the advancing march of improvement to retain the cognomen longer. If I have heretofore used the term radical it has been only to convey to the general profession a more distinct idea of the nature and possibilities of my operation. I now will gladly join hands with you of the profession in erasing from our vocabulary wherever we possibly can the word 'Radical Cure,' and I feel confident that under the less pretentious phrase, 'Cure of Hernia,' we shall accomplish just as successful results as with the more ambitious cognomen in general use.¹⁵

In presenting to your notice the various mechanical cures for Hernia, such as external compression, the application of sutures, of metals, catgut or silken cords, the insertion of goldbeaters' skin, the invagination of the external abdominal covering or any other device, whether herniotomy, tendinous irritation, or the actual cautery, I would have you take into consideration the remarks of our distinguished and learned fellow and one of Boston's adopted sons and renowned operators as well as teachers in surgery. His remarks at our last February meeting of the Suffolk District Medical Society were that it was a well established fact and a true principle of surgery that all the operations that had, to his knowledge, been performed for Hernia had sooner or later, with hardly an exception, given way in a few days or years where a cure had been attempted by sutures or pins for the relief of the sufferer. There never were truer words uttered by any surgeon ancient or modern than these of Dr. D. W. Cheever,

whose name shines brightly in the annals of our society and upon the pages of surgery. Words like these are comparable to the utterances of a Webster in constitutional law, and I take great pleasure in recording them. Well may the state of his nativity take pride in claiming such sons in medicine and law. But while his remarks, as well as those of Dr. Henry H. Smith, in his *Principles and Practice of Surgery*, are true of all previous operations for the relief and cure of Hernia, still we must remember that in all these operations a different irritation and a different amount of effusion is produced from that produced in the operation by injection now under consideration, and that by their methods of operation either the surrounding tissues are directly excited to absorb the lymph that has been effused or else they produce suppuration which is always fatal to the adhesive formation of lymph tissue whether this lymph is produced on muscles or on tendons.¹ Even if by this new method of injection for cure there should be a tendency in the newly formed tissues to melt away, the process will be so gradual and will take place from such a superabundance of tissue (as has been fully borne out by experience) that nature will have sufficient opportunity to reassert her power and form afterwards out of the effused plasto-lymph as strong a tissue to say the least as ever originally existed around the rings.

May we not hope then, with your generous efforts as well as those of the profession at large, to perfect this operation and present to the world a glorious exception to all the previous operations? Who would not lend a helping hand to give this priceless gift to our fellow-men?

If I perform this or any other operation I wish, as any medical gentleman would, to do it well; but because I wish all this it is not necessary that I should make a specialty of curing Hernia only, nor need I feel inclined to follow the

¹ See p. 205.

example heretofore set by some to keep all of my doings in this operation from the light of the profession. My whole professional life, and all that is manly in my nature, revolts against pursuing any operation in the art of surgery or medicine in secret and apart from my professional associates for the purpose of selfish aggrandisement or personal gains. I do not believe in an idea of specialists in our noble, grand, old profession. The gentlemen who generally follow one idea and branch as a specialty are apt to become circumscribed in all of their professional reasoning and acts: if the specialty is that of the diseases of women, all their ideas of the suffering and illness of the fair sex are centred in the uterus and its appendages; if the diseases of the eye, great opacity to every other ailment of the body. He who follows the treatment of the insane finds all insane except those who recover under his treatment. If Sir Henry Thompson removes stone from the bladder by a peculiar process of his own discovery, and does it successfully, he does not think it necessary that he should be interested only in the operation of lithophaxy; or because Henry J. Bigelow may have thought to improve the tube of Thompson, and to establish the toleration of the bladder to undergo prolonged operations, he does not operate for removal of stone only. No, gentlemen; those doing one operation exclusively, even if they do arrive at great perfection in it, lose their enlarged views on others that may be quite of as much importance as the single operation they perform. This is the reason we find Græfe, and Agnew, or Williams, operators of distinction on the eye, taking as much interest in other surgical operations or in any improvement in medicine or hygiene as in their own department. By this study and interest do they not have better perceptions of all that pertains to all professional advancement? You will also find Spencer Wells of England, Thomas and Barker of New York, and Brown Séquard of Paris, taking the

same interest in other branches as in that branch which they have so worthily developed and perfected by their study. In speaking thus, I would not have you think that I do not fully appreciate those who may have made a special study of any special branch of medical and surgical science, and that I intend to infer that we should not call such men to our aid and refer to them in any difficult operation requiring their peculiar operative skill. I do not, as is quite apparent, expect to do all the operations for the cure of Hernia, or overcome all the strictures of the urethra, or pass all the catheters of vermicular point into the human bladder. No, I give freely my instruments and my method of performing these various operations and I feel confident that in them all will succeed quite as well as I have or even better. In this way I not look for your full approval and support?

What has been called a *Radical Cure*? A cure has been considered radical when the tendons, muscles, and fascia forming the barriers to the protrusion of the bowels are restored to a normal firmness and power of resistance. Such a cure is tested by the firmness of the rings and the absence of inconvenience and tenderness when the patient has returned to his usual avocations. Hernia was formerly considered an immoral disease, and ever since the days of Hippocrates, Galen, and Celsus there have been constantly proposed new and pretended cures for this terrible affliction; yet it would be manifestly unjust to condemn all cures indiscriminately simply because they were new and because they laid claim to a complete cure. Many of them are, however, so thoroughly empirical and absurd that the barest mention of them will be sufficient. The more scientific methods employed have been either to plug up the orifice by articles which will fuse with the surrounding tissues, or to produce such an inflammation of the parts as will provoke adhesions of the enlarged opening, and hence a contraction. Some of these

methods are plausible, others probable, while others may justly lay the claim to fairly successful results.¹⁶

Among operations long ago obsolete, may be mentioned the '*cerat de brique*' of Fabricius, the vinegar bags of Verduc, the remedy of the Prior of Cabriere, which was an astringent plaster over the hernia and milk given internally, the method of A. Paré, which consisted of a cataplasm of iron filings with internal administration of diamond, Arnaud's decoction of dog-grass and laurel, the application of ammonium carbonate, as recommended by Belmas, &c.¹⁷

Compression.—Among the advocates of this well-known palliative remedy are Celsus, Theodorus Aetius, de Salicet, Norsia, Blegny, Trécourt, Petit, Juville, &c. Fournier, Beaumont, and Duplat favoured the use of compression combined with the application of astringents, while in Germany some went so far as to recommend pressure to such an extent as even to form gangrene.

Position.—This is too laborious a cure to be at all practical or practicable, yet Ravin, Rivière, de Hilden, Reneaume, Arnaud, Fedran, Hey, and Rieck have soberly advocated a horizontal position in bed for six months with topical compression and astringents, together with low diet, blood-letting, and purging as insuring a prospect of recovery.

Passing such unscientific procedures, we now come to methods of cure which rightly deserve the name of surgical operations. Some, to be sure, are more dangerous than others, while many, although now abandoned in their original form, have recently been revived in methods based upon them, but improved in various ways. These operations will include cauterization, incision, excision, ligature, suture, castration, scarification, dilatation by organic plugs, acupuncture and closure of the rings either by wires or by injection.

Cauterization.—This operation of laying bare the hernia,

raising up the internal envelope without opening it, and cauterizing the ring with a red-hot iron is spoken of by Avicenna. Franco was in the habit of laying open the sac and touching the neck with a button cauter. Among the cauteries that have been used we may mention sulphuric acid, muriate of antimony, potash, essence of euphorbium, ranunculus, &c. The object sought was to obtain an eschar around the neck and thus to cause a suppuration sufficient to produce new tissue. The cauter was applied by two methods, one directly to the hernial coats. the other indirectly from the interior of the sac. In the former method there is the serious inconvenience of not penetrating deep enough to accomplish our result, or if we do succeed in cauterizing the right parts, of injuring at the same time some important and vital organ, while in the latter the danger of injuring the viscera by the cauter is avoided by pushing them out of the way.¹⁸

“*Incision.*—This has been so popular a method that it was not until the latter part of the last century that it was abandoned.¹⁹ The hernial coverings, together with the sac, were first divided as in strangulated Hernia. The viscera having then been reduced the opening was closed by suture. But the results were fatal almost immediately; and while Arnaud, Lieutaud, and Le Blanc favoured the operation, Acrel, Richter, Sharp, Abernethy and others as strongly condemned it as formidable and dangerous.

Just here it might be well to say that G. W. Hinman, of Derry, Vermont, recently reported one cure by opening the sac and brushing the inside with tincture of iodine, an operation which has in it some reasonable hopes of success.

“*Excision.*—This consists in dissecting and removing the sac, and involves such exceedingly great and almost inevitable danger of peritonitis, that although practised by Bertrandi, Lanfranc, Arnaud, Schmucker, Langenbeck and others of more

recent date, it is painful even to think of it. After this was done away came the method of cutting down upon the sac and introducing a ligature which prevented hæmorrhage and did not expose, although it might involve, the peritoneum.

Ligature.—Some have applied the ligature directly upon the sac by cutting down upon the parts; others apply it to the superficial integument.¹ Celsus speaks of those who placed the integument between two pieces of wood and pinched it so as to produce gangrene, while Saviard and Desault constricted the hernial envelopes so as to produce its mortification.

It is recorded of Guy de Chauliac that in 1360 he laid bare the sac and then applied a ligature around its neck. Although this may be an operation to be preferred above cauterization, yet as it is essentially painful and dangerous in its liability to injure the peritoneum, it seems strange that in recent days it should be revived. An attempt was, however, made in 1872 in Paris and Lyons, by M. Martin, to rescue it from oblivion, and within the last thirty years by J. C. Nott, of Mobile, Alabama, who binds the columns together by a leaden ligature, at the same time compressing the sac, but taking care not to constrict or involve the spermatic cord.

Suture.—Closely allied to the preceding method is the method of suture which is applicable especially to inguinal Hernia in males, and as it involves only the external ring, can be applied only to the direct kind of inguinal. Some accomplish the suture after a tedious dissection, but Thomas Wood of Cincinnati, Ohio, in 1851 passed a suture through both columns of the ring and bound them together by adhesive inflammation,

¹ This cure is especially applicable to young subjects. Although censured by Sabatier, Scarpa, and Sir A. Cooper, as producing convulsions and inflammation in children, it has been successfully used by Desault and Dupuytren. For an improved cure by ligating with carbolized catgut see p. 114 for Lister's antiseptic method.

taking care not to compress the sac.¹ The new tissue formed however in these cases has not been found sufficient to prevent the return of the Hernia.

¹ Essentially the same method has been used by G. Dowell, of Texas, who about 1859 performed the operation in the following manner:—The double spear-pointed needle (Fig. 23) being threaded with silver wire at one end, a portion of the skin and cellular tissue was pinched up over the hernia and the needle inserted and pulled through until the threaded point reached the superior tendon of the external ring. The sac was now invaginated and the needle passed through both superior and inferior tendons



FIG. 23.—Dowell's Needles.

of the ring. A second ligature was applied in the same way and both tied over a piece of cork, drawing the edges of the two tendons together.

Another method by ligature is that recently devised by Octavius White, of New York, and soon to be given to the profession. The point *A* is invaginated into the ring. The needles are then pushed out through the

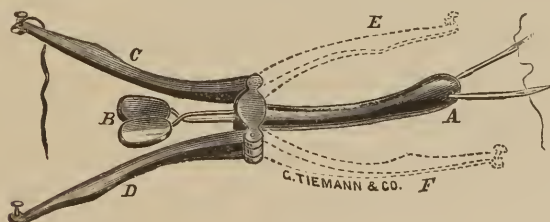


FIG. 24.

integument and a ligature tied over the two handles and knobs *C* and *D*, these handles being turned over, as shown by the dotted lines. The needles are then withdrawn and the instrument, weighing less than an ounce, is left in place for some days.

S. R. Beckwith, of Cleveland, Ohio, also reports a process (May, 1872,) for the cure of recent inguinal and umbilical Herniæ by a hare-lip suture.

Castration.—Some of the operators by excision, ligature and crowding up of the sac, finding the operation too tedious enveloped the cord and sac by the same thread; from this originated castration as a method of cure. This was long ago interdicted by law, even by Constantine, although in very recent years many have boasted of the number of cases thus operated upon in secret. It is not only dangerous to life, unnecessary and barbarous, but it offers no hopes of a radical cure.²⁰

Gilded Point.—To prevent the loss of the testicle, this operation was invented. It was used by Buchwall, in Denmark, and by Berault and A. Paré, in France. It is practically the same as castration, although theoretically it avoided compressing the cord, compressing only the sac.

Royal Suture.—This ancient process consisted in dissecting the sac and sewing it up without involving the cord. It is nothing more or less than suture applied to scrotal Herniæ, and was fancifully called *Royal* by Fabricius because it saved the lives of subjects who if cured might protect the king in his royalty.

After taking this cursory and synoptic view of the ancient operations, what surprises us most is not that the operations of excision, incision and exposure of the sac and ligature of the same were practised in ages gone by, but that they should be revived with all their suffering and danger by modern operators when safer and better means of cure lie near at hand.

Scarification.—In this operation Le Blanc took advantage of the method of dilatation of the ring used for strangulated Hernia.

It is, after all, only a variety of the incision method already

mentioned and is open to the same dangers, although it is true that the effusion of lymph thus produced favours the consolidation of the tissues and not their relaxation as Petit has claimed. Alphonse Guérin, the tenotomist, scarified subcutaneously, and compressed the abraded surfaces with the pressure of a truss. The operation, though plausible, is nearly useless, although Heaton sometimes resorted to it when supplemented by his injection of *quercus alba*.

Organic Plugs.—Of this method there are five varieties:²¹

1. Plug of the Epiploon.
2. Plugging with the testicle or the sac.
3. Plug of integuments.
4. Plug with the invaginated skin.
5. The two methods of Belmas.

1. This applies to cases where we are dealing with an entero-epiplocele; the epiploon or omentum may be inserted into the rings and compel them to contract so that the Hernia will not reappear; Cooper, A. H. Stephens, of New York, Velpeau and Goyrand have in this way been successful in cures. The process is in some respects a natural one, but still has two inconveniences: it seems applicable only to strangulated Hernia and is liable to produce colic and traction upon the stomach. Besides it is not uniformly successful.

2. The obstruction of the ring by the testicle is a useless operation advocated by Moinichen and Scultetus. Garengéot and Steffen claim to have accomplished the same result by dissecting the sac and inserting it into the rings.

3. Jameson, of Baltimore, reported in 1828 one solitary case of a crural Hernia upon a lady, cured in the following way. He cut down to the ring, cut from the neighbouring integuments near the ilio-pubic ligament a strip two inches long and ten

lines wide, which he succeeded, he says, in engrafting into the ring. Although painful, complicated, and somewhat dangerous, it has every reason in its favour theoretically, in small femoral Herniæ. Practically, however, the fact of this reported cure is vitiated by the circumstance that there was no professional witness of the operation. His only follower was Redfern Davies, of Birmingham, England, whose instrument (Fig. 25) and operation seem to be a complicated modification of Wurtzer's. He also was successful in his case.

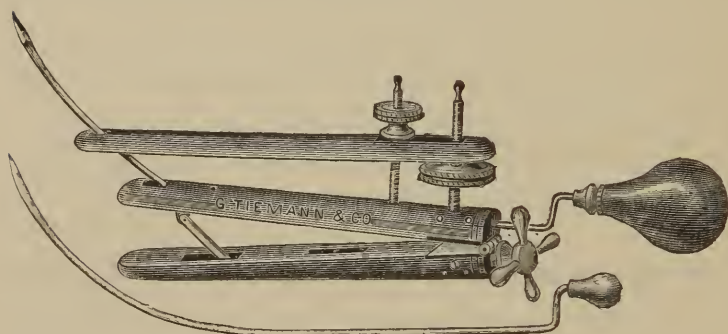


FIG. 25.—Redfern David's Instrument.

4. This is the method of M. Gerdy and Signoroni performed in 1837, and modified by M. Leroy. Velpeau reports one successful operation in his practice. Gerdy reports about sixty cases, some of which failed utterly after a time. The adhesions formed are in fact too slight and tender ever to consolidate, and although it may not involve serious injury to the epigastric artery still it may produce dangerous and even fatal inflammation and peritonitis. It is principally adapted to the inguinal form. A fold of skin is pushed as far as possible up the sac, and held by two interrupted sutures introduced one third of an inch from each other by a curved double-threaded needle through the covering tissues, the ends being tied over a bougie. The cuticle of this pouch is then destroyed by ammonia, which

causes the inflammation that is supposed to work the cure. The suppuration produces adhesion about the eighth day, when the threads are removed. But when the threads were removed the plug often came out and with it the hernia came down. Gerdy used the finger for invagination, while Signoroni used a piece of catheter. It not only often failed of good results, but was also frequently fatal, as Thierry has shown. The principles of the operation have in a modified form done some service in the hands of other operators, *e.g.*, Wurtzer and others.²²

D. Hayes Agnew, of Philadelphia, used an instrument (Fig. 26) like a bivalve speculum, with which to invaginate the plug, and then embraced the base of the plug with a silver wire, which

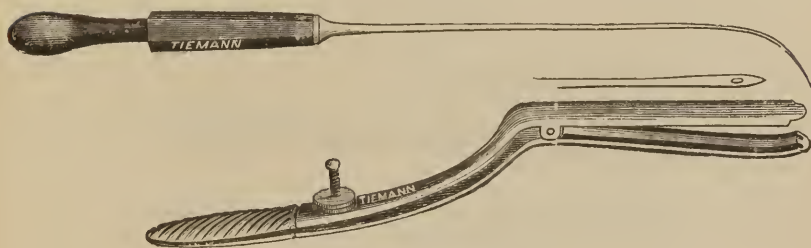


FIG. 26 — Agnew's Instrument.

could be removed after 10—14 days. This operation is no longer performed.

Belmas' Method. 1829.—The original operation consisted in the introduction and attachment of a small *pouch* of gold-beaters' skin to the upper part of the sac. The plastic material poured forth by the irritation produced by the presence of the foreign body spreads, involves this foreign body and forms the nucleus of an insurmountable barrier to the protrusion of the viscera. The operation was first tried upon dogs and with success. The first human subject operated on was easily cured by Belmas. He then induced M. Dupuytren to undertake the operation. This was upon a boy of fourteen, whose life was in

danger for ten days in consequence of the operation, but who was radically cured after two months, not only of a congenital hernia, but also of a hydrocele. Five cases in all were operated upon. Velpeau, who assisted in the last one, thinks the operation safe in itself, but provocative of remote dangerous symptoms.

Belmas now modified his operation and deposited in the sac *strips* of gelatine or goldbeaters' skin, instead of *pouches*. These strips were introduced by a canula which can be separated into two halves within the hernial sac. This second method is pronounced by Velpeau as even less beneficial than that of Gerdy and is now entirely abandoned.

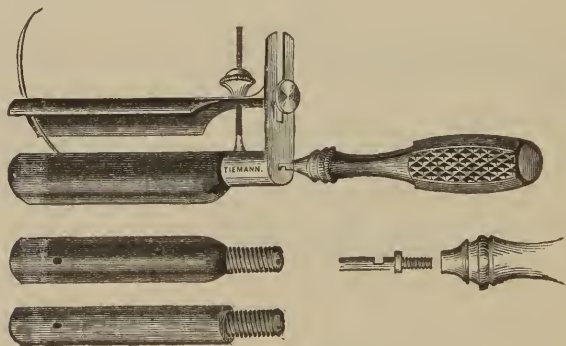


FIG. 27.—Wurtzer's Instrument.

Acupuncture.—A more simple method of cure was introduced by Bonnet, of Lyons, in 1836. It is called *acupuncture*, and consists in perforating the scrotum and sac near the rings with several pins, which are allowed to remain until they produce ulceration of the skin. M. Mayor of Lausanne, used a seton instead of a pin; but whatever the modification, the method is useless since the whole canal is left open and the sac only imperfectly agglutinated.²³

In 1838, *Wurtzer*, of Bonn, Germany, invented an instrument (Fig. 27) which carries out Gerdy's method of invagination simply

and safely. His instrument consists of three pieces — a wooden (or, as now used, hard rubber) cylinder, a long curved needle and a concave wooden cover to produce adhesions. The cylinder is three inches long and three eighths to three fourths inches in diameter, according to the size of the Hernia, of a flattened shape, perfectly smooth and rounded upon the free end, a short distance from which is the orifice for the exit of the curved needle which runs through the cylinder, and is attached to the movable handle. The cover is to compress the folds of integument during the operation and likewise has a hole in it for the needle. The protruded parts having been returned, the integument is pushed up the canal with the forefinger of the left hand, the cylinder is introduced into the cul-de-sac thus made, the finger at the same time being withdrawn. When the end of the cylinder is in the internal ring, the needle is pushed through the sac, canal, and integument. The handle is then removed and the rest of the instrument allowed to remain in position 6 or 8 days. The puncture made by the needle suppurates by the fourth day, the bowels are not allowed to move, rest is enforced, with a plain diet, and then a truss is worn for six months or more. Dr. Otto Weber, of Bonn, says, however, that of fourteen cases operated on by Wurtzer, not *one* was cured, for the rings are not closed and the plug gradually withdraws. The failure is not due to peritonitis, but rather to the insufficient character of cellular or lymphoid tissue poured forth by the suppuration. Such tissue from its very nature never can be permanent, and is entirely different in this respect from that produced by irritation of the tendons by injection.

This operation has been followed by Mosmer, by Rothmund, in Munich, Sigmund in Vienna, and by Spencer Wells in 1854, in the United States.

Professor Armsby, of Albany, New York, has modified the operation by allowing a thread, which is occasionally moved to

produce inflammation, instead of a needle, to remain in the hernial sac and internal ring so as to cause the necessary supuration. Dr. J. W. Riggs, of New York, in March, 1858, also advocated the use of a seton, but on a larger scale, and reported several successful cures.

Still another modification is that of Dr. Hachenberg, of Dayton, Ohio, who used an ivory ball threaded by a double thread to produce the supuration.

Since, however, the operations of Thomas Wood, Dowell, Wurtzer, and Gerdy, with all their various modifications, do not involve the internal, but only the external ring, they are not applicable to the oblique *Herniæ*, whatever little may be

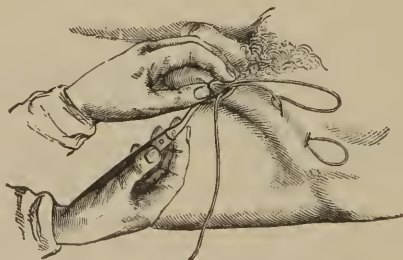


FIG. 28.—J. Wood's Operation.

said of their probable or possible value in the relief of the direct variety.

Operation of Wood, of King's College Hospital, London. This operation consists of the 'compression and closure of the tendinous sides of the hernial canal throughout its *entire* length' (Fig 28). It differs from the older operations by being entirely subcutaneous, and by puncturing the sac only by a small valvular opening. The hernia being reduced, an incision through the scrotum is made by a tenotomy knife sufficient to introduce the forefinger and a needle. The fascia is then detached from the skin for the space of two square inches, and invaginated into the canal. The needle is now passed through

the conjoined tendon, upwards and inwards through the internal pillar of the external ring. A wire about two feet long is introduced into the needle and drawn out through the scrotal aperture, one end projecting from the puncture above. Then with the finger placed behind the external pillar, this pillar and Poupart's ligament are raised from the deeper structures. The needle is now passed below the internal ring and through Poupart's ligament to emerge at the puncture already made in the skin and the wire drawn back into the scrotal puncture. The sac is pinched up and the cord slipped back from it as in taking up varicose veins. The end of the inner wire is now hooked to the needle and drawn back across the sac. Both ends of the wire are then twisted together into the incision so as to twist the inclosed sac likewise while traction upon the loop invaginates the sac up into the canal. This loop is then joined to the two ends of the wire in an arch beneath which is a stout pad of lint. After 10 or 15 days the wire may be withdrawn. It is reported that 65 to 70 per cent. of the cases thus operated upon have been cured, although many of them have returned to their original state after the lapse of several years."¹

Operation of Dowell. — I here place my friend Dr. Dowell's operation, which he has very kindly written out for me, to insert in this work in his own words.

MELROSE, MASS, *July 17th 1880.*

"DR. J. H. WARREN :

"DEAR SIR,

"Inclosed herewith I give you a synopsis of my *subcutaneous ligature* for the radical cure of Herniæ. I commenced the investigation of the cure more particularly in 1858, and continued these investigations until in 1859, 10th Sept. in the night and in bed, thinking over an operation with Wurtzer's instrument I was going to perform next morning, I

¹ See p. 243.

planned the entire operation as I now perform it with slight modifications as to the needle and other details which I will give you as briefly as I can. I started well with the idea to cure Hernia; we must adopt some method *by which we can restore the natural supports to the abdomen*. That in operating for Strangulated Hernia it was often the case that within from one to two days the adhesions became so great that it was impossible to separate them without cutting, showing that to get adhesions it was not necessary to fasten the surfaces brought in contact, that *single contact with slight pressure would cause all peritoneal surfaces to unite*.

"The next question was how could we best do this, and at last I projected and had made in 1866 by Messrs. George Tiemann and Co., New York, the needle shown in Fig. 23, p. 101, with an eye in each end, which I have changed since only by adding an eye at one end. The needle is made first with a groove from eye to eye, or rather from point to point to keep it from bending or breaking. The needle is from four to six inches long. At first I had it only three inches and the eye in the centre, but I found this too short, and the eye in the centre prevented the reversing of the needle which acts as a weaver's shuttle.

"*Operation.*—I prepare my patient by having his bowels moved several hours before the operation and the urine voided before going on the operating table. The parts are then shaved of all hair and three lines made with a pencil or ink, one immediately over the centre of the tumour; two about one or two inches on the sides of the first. Thus:—



FIG. 29.

For left inguinal the needle is then threaded with some strong thread, I usually use wrapping twine used in the drug-stores. I thread only one eye and twist the thread hard and use it. I have from one to seven silver wire ligatures ready, and after putting all the threads in I think necessary I replace them with the silver wire. Thus prepared, the patient is put under ether or chloroform. I now take the unthreaded end in my right-hand finger and thumb while I pick up the skin and cellular tissues with my left hand to remove it from the sac and tendons. I then put the threaded point below my left-hand finger and thumb and run it through the elevated portion of the skin and cellular tissue until the unthreaded end rests on the tendons just under the line on the right or left as the case may be. At this stage, still holding the needle, the Hernia is invaginated and the left index finger is put in to guide the needle under the tendons and from one side to the other until I bring out the unthreaded end in the line on the other side. I then pull on the unthreaded end until it gets loose above the tendons and then push back the threaded end to where I first started and the two ends of the ligature cross each other and are finally tied over a roll of adhesive plaster which I now mostly use. A bougie or piece of wood or cork will answer, it being fastened simply as a quill-suture; but the adhesive plaster is soft and fits well, and I believe is the best thing I have used. I begin to put the ligatures in at the upper point of the rupture and continue them down until I have put in a sufficient number to close the rupture, using from one to seven according to the size of the opening. The ligatures have been left in from three to eight and some, in first case, fifteen days. The ligatures before tying are simply pulled up so as to close the wound, or bring its edges in contact with slight pressure; if they are made too tight they will cause suppuration, and perhaps a failure, as all my failures suppurated and as I

think by pulling the ligatures too tight. The ligatures are removed when I think I have produced sufficient inflammation to cause complete union, and this must be judged according to the case, but if no tendency to too much swelling leave them to seventh day at least. The bowels should again be moved before the ligatures are removed and a compressing bandage applied. Patient ought to keep quiet in bed for at least a week and avoid straining, coughing, laughing or anything that will press on the ring. I, last summer (1879), invented what I call my buggy spring truss to apply after these operations, to support the parts while they are tender and in all cases where the patient is only relieved. The spring is made rather thin and not very

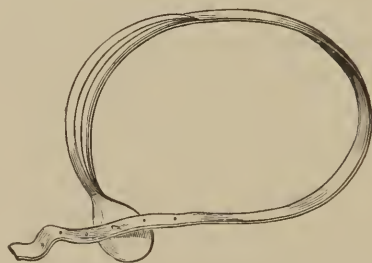


FIG. 30.—Dowell's Buggy Spring Truss.

strong; and two extra springs are put on over the main spring as the springs are fitted in a buggy (*see* Fig. 30). The whole is covered with soft leather, and adjusted over the rupture making only very light pressure while the springs prevent continuous pressure; but when there is a tendency to protrusion they become very strong and will not allow any protrusion sufficient to rerupture. This truss will be beneficial in the *subcutaneous injection method* as practised by yourself at the present. With the two methods *subcutaneous ligature* (by my operation) and *subcutaneous injection* as practised by yourself, with the aid of this truss, I sincerely believe all cases can be cured and without danger. The result of my operation

so far as I can learn is about as follows : one hundred and three cases treated by myself ; twenty-four cases partially relieved, two cases reported as made worse, one child died in seven days after operation, with congestion of the brain, but no doubt the chloroform and operation had something to do with the development of the fever which was of the malarial form of congestion of the brain. Cures seventy-six. So far as I know all these remain well, some have had partial return of the Hernia and wore trusses. Several were operated on twice and failed both times ; I know no particular reason for the failures except the ligatures were put in too tight. The ligatures should be carefully cut just under the knot and at one side of the knot. If cut on the side or the knot cut off, when the quill is removed the ligatures become buried and cannot be removed, and have suppurated and caused a great deal of pain, and in almost every case a failure. This is a little thing, but is one of the most important in the whole operation. When the patient suffers any pain I give full doses of morphia and apply cold cloths or astringent washes with morphia over the ligatures. Where there is no pain I simply put a piece of lint over the ligatures and saturate it with collodion.

“The operation above has been performed about two hundred times by different operators. Drs. Wilkerson and Trueheart, of Galveston, Texas ; Drs. Worthington and Bibb, of Austin, Texas ; Dr. Powell, of Florence, Texas ; Dr. Ruskin, of Groesbeck, Texas ; Drs. Allis and Hunter, of Philadelphia ; Dr. Johnson, of Richmond, and many others. Their exact statistics are not at hand, but I believe they have had equal or even better success than myself, as I included in my list all the cases operated on in my experiments to perfect the operation. My greatest fear was of general peritonitis, but this has not happened in any case of mine. Some ask, do you inclose the spermatic cord in the ligatures ? No, never ; it is kept below the

ligatures by the invaginating finger. The subcutaneous injection is specially useful in Herniæ of small size and recent date, while the subcutaneous ligature is suitable to large Herniæ and of long standing, and, as I believe, contains the only principles of success in Herniæ large and of long standing.

“Yours most respectfully,

“GREENSVILLE DOWELL, M. D.”

Antiseptic Use of the Carbolised Catgut Ligature.—With the consent of the author, Dr. Henry O. Marcy, of Cambridge, Mass., I reprint from the *Transactions of the American Medical Association*, 1878, the following essay:—

“October 11, 1871, I, read a paper before the Middlesex County Medical Society, which was afterwards published in the *Boston Medical and Surgical Journal*, November 16, 1871, page 315, entitled ‘A New Use of Carbolised Catgut Ligatures.’ I there reported the two following cases, operated on for Strangulated Hernia.

“CASE I. ‘On the 19th of last February I was called in consultation by Dr. A. P. Clarke, of Cambridge, to see Mrs. M., aged sixty, who had for years suffered from Hernia. Five days previously she had been seized with severe pain in the inguinal region, accompanied with vomiting, and had been confined to her bed since that time.

“‘Long-continued and careful taxis had failed to reduce the hernia; and for twenty-four hours the vomiting had been stercoraceous, and the patient seemed *in extremis*. The hernial tumour was the size of an egg, protruding from the external inguinal ring. A careful dissection exposed the sac, which was closely adherent to the surrounding parts. The constriction was in the ring, bounded below by Poupart’s ligament, and above by the transversalis fascia and conjoined tendon.

“‘The stricture was divided in the usual way, with the

hernial knife carefully introduced upon the finger. This was accomplished with some difficulty, owing to the constriction of the ring. The sac, unopened, was then pushed up with its contents into the abdominal cavity, and two stitches of medium-sized catgut ligature were taken directly through the walls of the ring. The wound was dressed antiseptically, and from Dr. Clarke's notes, taken at the time, I find that the patient complained of no pain, steadily progressed without accident, and was discharged, convalescent, March 12th, three weeks after the operation.

“‘The wound did not close entirely by first intention, but a careful daily examination showed no trace of the ligatures, and an abundant deposition of new tissue could be felt in the line of the opening about the walls of the ring. The result was a radical cure of the hernia, and a firm, hardened deposit may still be felt marking the closure. The ligatures were first suggested to my mind, because the patient suffered severely from an asthmatic cough, and it was at least desirable to secure a temporary strengthening of the weakened ring.’

“She died six years after the operation, and was troubled with the cough during the entire period, but had no return of the hernia.

“CASE II. ‘Mrs. L., aged forty-five, had been very much reduced by excessive menorrhagia, and upon March 10, 1871, my attention was called to an old, direct inguinal hernia of the left side, usually supported by a truss, which had come down the night previously and defied the patient's efforts to replace. After two attempts to reduce the hernia under ether had failed, assisted by Dr. W. W. Wellington, of Cambridge, I operated as in the first instance, dividing the constricting ring and replacing the sac and its contents unopened. Three carbolised ligatures were applied through the walls of the ring, and the wound was carefully dressed with carbolised lac plaster.

“‘As in the first case, there was complete absence of pain,

the wound united without suppuration, there was an abundant deposit of new material about the ring, and when last examined in June, the cicatrix was linear, but a firm, hard deposit of new tissue could be felt marking the site of the sutures.

“‘On the 7th of April my attention was called to the wound by the patient, who felt a slight uneasiness, and I discovered a small swelling in the cicatrix about the size of a bean; this, upon being opened, discharged a drop or two of pale, serous looking fluid, which microscopic examination proved free from pus cells, but it contained a few shreds of connective tissue, which appeared to be minute portions of one of the ligatures. The cure is radical, and in neither case has the patient used a truss since the operation.’

“I then say, as far as my observation has extended, this is a new use of the carbolised catgut ligatures, and suggests a still wider field for application. No method of operation for radical cure of Hernia appears more feasible, is probably attended with less danger, and at the same time affords a means of closing and strengthening the weakened ring, which is so desirable, and yet, with all the ingenious devices of surgery, is so difficult to obtain. As perhaps might have been expected, the article attracted very little attention, written by a young man fresh from his European studies and an ardent admirer of Professor Lister, whose views at the time, I believe, were not accepted by a single surgeon in the Boston district.

“In these days of improved means for the reduction of Hernia, by the use of ether, by aspiration, and by rest with the hips higher than the shoulders, with the ice-bag applied locally, the surgeon in private practice is called upon to operate for the relief of Strangulated Hernia much less frequently than formerly. As far as I remember, I have operated for Strangulated Hernia only four times since the publication of this paper, and these

cases were treated substantially as those above given. The last case, inasmuch as it affords the opportunity of showing the result anatomically, merits a careful study, and causes me to bring the subject to your attention now.

"Mrs. W., aged seventy, had been for many years an invalid from double inguinal Hernia, the right side being of such proportions that, after many endeavours to retain it by a truss, this appliance had been thrown aside as useless. On the left side was an irreducible omental hernia, at times complicated by the escape of a loop of the intestine through the ring. Nausea and vomiting had persisted for thirty-six hours before the operation.

"As usual, antiseptic precautions were used, with carbolised spray and careful dressings. After slightly enlarging the ring, the intestine was easily reduced, but the omental portion, the size of a small orange, presented a number of bleeding points upon its being unravelled, and was adherent to the walls of the ring. Because of this, the whole mass was tied with catgut and removed, the ring was carefully closed with catgut sutures of a large size, No. 2, I think, five in number. The wound healed by first intention throughout. Temperature never exceeded 99° F.

"The patient suffered no pain, and made a perfect recovery. She was allowed to get up in two weeks, and never wore a truss. She was so much pleased with her happy escape from danger and her complete cure that she besought the privilege of being operated upon for the radical cure of the right side. I tried again a series of trusses, but to no avail, and after careful reflection consented to perform the operation. This took place February 4, 1878. The abdominal wall was thin, the ring extremely large, and its pillars were attenuated. The sac was readily returned unopened, and sutures were used as upon the other side, perhaps eight in number. I included in my stitches

as much tissue as possible, but at the close of the operation felt the cure less satisfactory because there was so little material to fill in and support the weakened ring.

"The union was entirely by first intention, leaving, as before, a linear cicatrix which never suppurated. There was no elevation of temperature, and the patient made a rapid recovery. During the first week there was considerable swelling of the tissues about the ring; these parts were slightly tender upon pressure; and, what I believe to have been the thickened returned sac could be felt through the attenuated relaxed abdominal walls. The patient was kept in bed three weeks; but upon being permitted to get up it could be easily seen the cure was not complete, for there was impulse on coughing and a slight protrusion through the ring. She was fitted with a light truss, which easily retained the hernia, and was allowed to go about the house. She died suddenly, April 17, 1878, and the autopsy revealed an aneurism of the internal carotid of the right side, which had given rise to scarcely any symptom, except a gradual loss of vision of the right eye, but its existence had not been suspected.

"The specimen here presented shows the walls of the ring much thicker than before the operation, and its calibre diminished perhaps two-thirds. A light truss would probably have been sufficient easily to hold the parts in their proper relations.

"The use of animal ligatures in surgery is by no means new. In all probability catgut, the form of animal thread or ligature which has been most frequently used in modern times, was employed as surgical sutures eight or nine hundred years ago. The celebrated Arabic writer, Rhezieus, who practised in Bagdad about A.D. 900, speaks of stitching up wounds of the abdomen with a thread made of the string of a lute or harp; and another Arabic author, Albucasis, who lived a century or two later,

alludes in the same class of injuries to stitching a wounded bowel with a fine thread made of the twisted intestine of an animal. The strings of the ancient Egyptian harp, and hence probably of the Arabic, were made of catgut. Homer, in the *Odyssey*, speaks of the strings of the old Greek harp as made of the twisted intestine of the sheep.

"To Dr. Physick, of Philadelphia, is undoubtedly due the honour of having first introduced animal ligatures into surgical practice. His ligatures were made of chamois leather. Silk may be considered an animal product, but however used, even when carbolised and inclosed in a wound which readily heals by first intention, the softened fibres usually act as an irritant, and are later discharged by the processes of suppuration. Animal tissues made but indifferent ligatures; and were practically long since abandoned. They were soft, slippery upon being immersed in water, and were by no means strong.

"To Professor Joseph Lister we are indebted for a most important modification of the catgut ligature. In his enthusiastic devotion to his new ideas of the possible repair of tissue, he had observed that, under antiseptic dressings, clots of blood and large pieces of dead skin and other tissues had disappeared without suppuration; therefore he inferred that small pieces of animal texture, if applied antiseptically, would be similarly disposed of. To make catgut antiseptic, he immersed it, as prepared for the violin, in a strong watery solution of carbolic acid, and noticing the changes which followed in its texture, after considerable variety of experiments, he gave us the ligatures as at present used. They are prepared by immersion of the gut in a mixture of five parts of fixed oil, olive or linseed, to one part of the crystallized acid, liquefied by the addition of five per cent. of water. After a few weeks' suspension in this fluid, the catgut becomes translucent, firm, hard, but moderately pliable, makes a strong knot, and upon immersion in water or

the fluids of the body, it undergoes no immediate change, and for days together the knots retain a firm hold.

“To show the importance of the proper preparation of the ligature, I quote from Professor Lister’s original paper, published in the *Lancet*, April, 1869: ‘But for the sake of surgeons who may wish to prepare it for themselves, it is necessary to mention, in order to avoid disappointment, that the *essence* of the process is the *action* of an *emulsion* of *water and oil* upon the *animal tissue*. The same effect is produced upon the gut, though more slowly, by an emulsion formed by shaking up simple olive oil and water, as by one which contains carbolic acid.

“‘On the other hand, an oily solution of carbolic acid without water has no effect upon the gut beyond making it antiseptic, and if water be added only in the small proportion which the acid enables the oil to dissolve, though the gut is rendered supple, and acquires a dark tint from the colouring matter of the oil, it will be found, even after steeping for months in such a solution, that when transferred to water it swells up and becomes soft, opaque, and slippery, as if it had not been subjected to any preparation. How it is that an emulsion produces this remarkable change in the molecular constitution of the tissue I do not profess to understand. I was at first inclined to regard it as a closer aggregation of the particles, brought about by a kind of slow dying of the moistened gut in the oil, as the watery particles precipitate to the bottom of the vessel; but, not to mention other circumstances opposed to this view, the oil remains turbid for a very long time, the finer particles of water being extremely slow in precipitating, and if, after the lapse of weeks, a piece of dry unprepared gut is suspended in it, the thread is soon rendered soft and opaque by the very liquid in which gut which has been longer immersed is growing constantly firmer and more transparent.

“‘It is necessary that the gut be kept suspended so as not to

touch the bottom of the vessel, for any parts dipping into the layer of precipitated water would fail to undergo the change desired.

“ ‘The vessel containing the emulsion should be kept undisturbed, for if the water is shaken up with the oil the process is retarded. An elevated temperature, of about 100° F., seems for a while to promote the change, but ultimately leaves the gut in an unsatisfactory state compared with that obtained at an ordinary temperature; and conversely, some portions of gut which I have prepared in a room without a fire, in cold weather, at a temperature of about 46°, were in one week already in a trustworthy condition for surgical purposes. Hence the gut should be prepared in as cool a place as possible. The longer it is kept in emulsion the better the gut becomes. I once feared that in time it might grow too rigid for convenience, and possibly brittle also; but experience shows that this is not the case.

“ ‘When removed from the emulsion it soon dries in the air, but retains a considerable portion of its carbolic acid for several hours, so that no apprehension need be entertained of loss of its antiseptic property from exposure during the performance of an operation. In course of time it loses all the carbolic acid also, but retains permanently its altered molecular condition. If thus kept dry, as may prove the most convenient for the manufacturer on a large scale, it must be steeped thoroughly in some antiseptic lotion before its use. And for the surgeon the most convenient way will probably be to keep it always in the antiseptic emulsion, so as to be ready for use whenever it is required.’

“ ‘Dr. D. W. Cheever, of Boston, writes me under date of May 14, 1878: ‘I tried catgut for a radical cure of Hernia, but it was speedily absorbed and failed.’ He is unable to give me particulars with regard to the use of the ligatures.

"Dr. J. C. Warren wrote me a few day since : 'I should fear that they would not hold long enough to keep the parts in apposition until union becomes firm. We have given up their use at the Massachusetts General Hospital for this reason : they do not hold longer than four days.'

"I believe there are distinct limits to the usefulness of the catgut ligature, and if our profession early learns to know what these limits are, not only may the lives of our patients be less endangered, but an aid to surgery which now promises much of good will be rescued from wholesale condemnation and oblivion. In plastic operations, especially of mucous tissues, I would never think of using catgut ligatures.

"In wounds exposed to the air, or liable to suppuration, where the ligatures are soaked in fluid secretions, I am well aware the catgut knot is liable to become loose; but in the antiseptic ligation of vessels, or the closure of deep-seated tissues, it is far superior to any other. Here, when properly applied, it is open to few of the objections made. Owing to the firm character of the material, circulation of the inclosed part is more liable to be impeded than with silk ligatures, and hence care should be exercised; but within the limits here assigned, an experience of eight years justifies their use.

"Judging from my own observation I am inclined to believe the ligature properly, that is antiseptically, used is not absorbed at all, but is changed particle by particle, being in this way not revitalised but replaced by living tissue, thus producing a reinforced band of new connective tissue in place of the ligature itself.

"The specimens here shown I think demonstrate this. The one last operated on, February 5th, death taking place April 17th, namely, sixty-eight days after the operation, shows unmistakable thickening of the connective tissue about the ring; and there are yet seen, although preserved in a bichromate of

potassa solution, hence less distinctly than at the autopsy, traces of the ligatures. These are of a darker colour than the surrounding parts, retain imperfectly the shape of the ligature, and are of considerably greater density and firmness. Under the microscope they show only wavy bundles of connective tissue. In the older specimen operated on December 2d, after the lapse of four or five months, you can no longer trace constricting fibres in the shape of circumscribed bands, but you will find a firm reinforcement of the parts by connective tissue which certainly includes the walls of the ring, and hence we infer it is developed about, or transformed from the ligatures themselves. This quite accords with Mr. Lister's experiments in the ligature of arteries.

"From the article previously mentioned I quote as follows 'Thirty days after the operation, the animal, a calf, which had continued in perfect health, was killed, and the parts removed for examination. On dissection I was struck with the entire absence of inflammatory thickening in the vicinity of the vessels, the cellular tissue being of perfectly normal softness and laxity. On exposing the artery itself, however, I was at first much surprised to see the ligatures still there, to all appearance as large as ever. But from my other experiments, it might have been anticipated that the ligatures of peritoneum and catgut placed on the calf's carotid would, after the expiration of a month, be found transformed into bands of living tissue. Such was in truth the case, as was apparent on closer examination.

"Mr. Fleming published in 1876, in the *Lancet*, a series of observations upon the 'behaviour of carbolised catgut inserted among the living tissues,' and gives his results confirmatory of such change. 'A softening takes place from without in, the catgut breaking down and becoming infiltrated with cells. The mass into which it has been converted begins to metamorphose and is soon permeated with blood channels, and ultimately may

be described as a cast of the catgut in a kind of granulation tissue, freely supplied with blood-vessels, which in many of my sections are easily injected.' These views should not seem exceptional, when we remember many well-known facts, for example, that the revivifying of skin dead at least by separation for a considerable period, as in that from an amputated limb, goes on so uniformly that transplantation of it upon granulating surfaces, and these not best fitted for its growth, has now become a daily practice in surgery.

"Even the epithelial cells removed by a considerable distance from the circulation, and already dead, thus live again, and multiply so rapidly as to be of practical use in the repair of large denuded surfaces. The periosteum, as Ollier and others have shown in their experiments, may be also transplanted, and not only live but become an active factor in the reproduction of bone; and teeth have been removed, filled, and replaced, actually transplanted to other locations, and regained their lost relationship of nutrition.

"The spurs of the cock, as observed by Baronius, when transplanted to the comb, not only live, but remarkably increase in size, and when ingrafted into the ears of oxen, as is practised in Mexico, they attain a size truly wonderful.

"Mantegazza described and figured one of these spurs, which in its dry state weighed nearly one pound (396 grammes), was twenty-four centimetres in height, and twenty centimetres in width.

"If such wonderful activity of reproduction and growth are shown by these tissues, there would appear to be no reason why the cells of the fibrous tissues might not also undergo changes in nutrition equally remarkable, of which practical advantage may be taken.

"This is not the place, nor have we the time for a careful review of the history of the various devices suggested for

the radical cure of Hernia. For centuries this has been a prolific field for charlatans and for quacks of every description. Hernia-curers roamed over Europe a century ago, practising castration and various reckless and dangerous devices, at the cost of many lives, and, it is needless to say, with the performance of few cures.

“ Within the present century many of the best surgeons have given this subject careful study, and some of the most ingenious of surgical devices have been brought into requisition. Nearly all of them have sought to accomplish a cure by one of two ways : either by producing adhesive inflammation and obliteration of the sac, or by producing closure of the ring. Monsieur Bonnet inclosed the cord between pins fastened to rolls of linen. Gerdy plugged the ring with invaginated skin held by stitches, and afterwards with the object of correcting the tendency of the invaginated skin to be withdrawn, cut it free, and ended with a plastic operation, by raising a flap from below. This method was often successful in his hands, but its complication and dangers prevented its general adoption.

“ Belmas invented an instrument, consisting of a canula with stylets. Through the passage in the canula threads of gelatine were to be introduced and be ultimately absorbed, after having produced the requisite adhesive inflammation. Then he applied a truss.

“ The operations of Velpeau, Wutzer, and Wood are better known. Mr. Wood operated about two hundred times, with the result of three deaths and about seventy-five per. cent. of reported cures. Acupuncture, a revival of the punctum aureum of the ancients, as practised by Dr. Pancoast of Philadelphia, though unsuccessful as a means of cure, suggested to him, as well as to Dr. Young of Tennessee, the use of subcutaneous injections of iodine or cantharides into the sac. A number of successful cases thus operated upon are reported.

"This method was practised for many years as a secret cure by Dr. Heaton of Boston, with reported success. Recently he has published a monograph upon Hernia, in which he gives a detailed account of his treatment and experience. He reports a large number of cures, and claims that his method is devoid of danger. It consists of a fluid extract of white oak bark injected with a hypodermic syringe into the sac.¹ This method has been tried with moderately successful results at the Boston City Hospital. By means of it, a considerable amount of thickening and narrowing of the ring is certainly produced.

"In 1858 Dr. Gross, in two cases, cut down upon the ring and brought together its walls with silver sutures. A cure followed in both cases. In 1871 Dr. Van Best reported three cases operated on for radical cure by a subcutaneous sewing of the ring with salmon gut. Two of these cases were successful.

"Dr. G. Dowell, professor of surgery in Texas Medical College, published a treatise on Hernia in 1877, and describes a new method for its radical cure. He there reports sixty-eight cases with sixty permanent cures, and at the date of this publication, he informs me the number of his operations exceeds one hundred. By a needle of peculiar construction he subcutaneously sews the pillars of the ring with silver wire. The testimony of such an indefatigable student, with his very large experience and remarkable results, is of the greatest value.²

"Mr. Charles Steele, of Bristol, reported in the *British Medical Journal*, November 7, 1874, a successful case of radical cure of Hernia, which was operated on precisely as were my own cases. The patient was a boy of eight. The surgeon used two stitches

¹ The operation has often been thus misunderstood. The needle was not an ordinary hypodermic syringe but had a blunt needle with two orifices near the end, so that the fluid might be thrown at right-angles upon the rings and not into the sac.—J. H. W.

² Dr. D. informs me, July 3rd, 1880, that he succeeds in 75 per cent. of his cases.—J. H. W.

of catgut antiseptically, and union followed by first intention. After six months the hernia returned, and the operation was repeated. A truss was applied for safety. A perfect cure was effected, in the judgment of the operator, a year later.

“ Nearly all the late writers on surgery, such as Bryant and Erichsen, deprecate any attempt to secure the radical cure of Hernia, except in severe cases; and Mr. Bryant regards the supposed elongation of the mesenteric ligament as a probable cause of the imperfect results obtained by various operators, but he supports his proposition neither by theory nor by fact. If the operation which I have proposed is done properly, with antiseptic care, I believe that to a great extent it is devoid of danger. In a series of papers upon Strangulated Hernia, based upon one hundred operations performed by himself, published in the *British Medical Journal* for 1872, Sir James Paget, in advocating the replacing of the sac unopened, if possible, says: ‘The structures divided externally to the sac are insignificant; and it might be difficult to name an operation less endangering either life or health than this would be. The peritoneum is not wounded; the intestine or omentum is not touched or exposed to the air; the wound may be small; any hæmorrhage may be easily stayed and must be all external. Thus the wound is favourable to speedy healing, and erysipelas, or any other mischief, is not likely to extend to the peritoneum.’

“ I would not appear over sanguine in the suggestion of any new method for the radical cure of Hernia. I am perfectly aware that this has ever been one of the most troublesome and unsatisfactory problems in surgery; and my experience has been too limited to prove little except possibilities.

“ However, I must claim a favourable consideration, on a legitimate field, for the use of the carbolised catgut ligature, at least in all cases of Strangulated Hernia where the wound can be closed. This method does not add to the dangers of the

operation, and is probably followed by a cure. In comparing the operation with that usually recommended, of subcutaneously stitching the ring with sutures of any material, it seems apparent that to cut down upon and expose the ring gives a much better opportunity of carefully closing it, refreshing its borders, and thus avoids injury to the spermatic cord, while it does not increase the danger of the patient.”¹

Injection. — This method marks an epoch by itself in the history of the radical cure of Hernia. Velpeau is, without doubt, the first who ever injected for the radical cure, and says that “sensible like other practitioners of the want of a radical cure for Inguinal Hernia, and convinced, moreover, for a long time that we were wrong in abandoning indiscriminately all the trials which had this object in view, I also have endeavoured to arrive at it by a special method. The process which I have proposed is the same as that which is employed for the radical cure of hydrocele.” In the early part of 1835 he had already conceived the idea of applying injections to the cure of Hernia, and in February and July, 1837, he performed successfully and without difficulty, the operation upon Herniæ with an iodine injection, first, however, *cutting down upon the parts*, but at the same time being very careful not to allow any of the injecting fluid to penetrate the peritoneal cavity. The injection was administered with “the canula of the trochar guided upon a blunt-pointed probe.”

We find also that my esteemed and honoured countryman, the late Dr. Pancoast of Philadelphia, cured thirteen patients in 1836, and that later my beloved friend, the late Dr. J. Mason Warren of Boston, injected sulphuric ether with success. In 1846, Dr. W. H. Roberts of Alabama made his first hypodermic injection for Hernia with oil of cloves. His idea of this operation had been derived from a Dr. Woogencraft, as I am informed by Surgeon Billings of the U. S. Army.

¹ See p. 270.

But the honours of the *true* hypodermic injection without any preliminary incision, I think, after much careful research in the literature of surgery, belong to the late Dr. George Heaton of Boston, who, "after eight years of discouraging experiment, discovered a process which I call *the method of tendinous irritation*,"¹ by the injection of a solution of quercus alba. Since he performed successful cures by his new method as early as 1840, and experimented as he tells us eight years previous to this, we are carried back to the year 1832, when he first conceived his operation. His first operations were with Dr. Jaynes of St. Louis.²⁴

In this brief sketch I have endeavoured to be impartial in my honour to the various operations, whether they are hypodermic or not. I would cast no reflections upon any one, nor at the same time endeavour to lessen whatever credit I think may justly belong to Heaton for bringing the operation to a full fruition and success. Previous operators have relied upon suppuration to produce their cures; Heaton tried to avoid it. In this is the element of his success, but as will be hereafter seen, I soon after taking up the operation, abandoned the simple fluid extract of oak bark which Heaton had used, and produced by a more stimulating preparation a much more abundant effusion of plasto-lymph. That, however, Heaton did by his simple injection, effect wonderful cures, can be doubted by none. The following is a fair example of his success.

A soldier by the name of Pitcher was ruptured in the femoral region at the battle of Big Bethel, and was discharged in the latter part of May from the United States service for physical disability caused by said rupture. Dr. Heaton operated upon him in June, and after the operation the man again enlisted as a soldier in the following September, and served his three years without sickness or return of his rupture. You who have been

¹ Heaton on Rupture. See, however, page 380 of present work.

with me in the United States service know that a soldier must be badly ruptured to be discharged from the army, and I will not weary you with more lengthy details. I examined this man in March, 1880, and he is still fully cured.

That Heaton also failed in some of his cases is also true. This all must expect, for one of the cardinal principles in surgery is that wounds will not always heal by the first or best intention, and that we never can certainly foretell the results of our best endeavours. Upon this point I will speak more at length further on. Here I trust I may be pardoned for inserting a clinical lecture delivered by Dr. William F. Janney, at the Philadelphia Hospital in January, 1880.

“GENTLEMEN :—I have the opportunity to-day of exhibiting to you a few cases of Inguinal Hernia, and by the consent of one of the patients who wished to be cured, I shall perform the operation of irritating the abdominal rings according to the Heatonian method, which method has been brought before the profession by Dr. Joseph H. Warren of Boston, in many articles in different medical journals and essays read before medical societies. I am not certain that Dr. Heaton deserves the credit of being the originator of the operation, but rather inclined to believe that to Professor Joseph Pancoast, Emeritus Professor of Anatomy, of the Jefferson Medical College, belongs the honour of being the first to attempt to cure Hernia by subcutaneous injection of an irritant into the inguinal canal. The records of the Philadelphia Hospital disclose the fact that Professor Pancoast, in 1836, injected into the inguinal canal and hernial sac Lugol's solution of iodine in thirteen cases of Inguinal Hernia, and that they were all cured of the hernia, and were retained on the farm attached to the hospital, and worked as farm labourers for some time. Some worked as long as one year after the operation without wearing a truss; and in no case did the hernia

return. It is with just pride that we claim this operation as a Philadelphia operation, and for a more detailed description of it I refer you to Pancoast's work on operative surgery.

"Heaton's claim I think will be recognised as a very slight modification of Professor Pancoast's, except that he used a concentrated extract of *quercus alba*, instead of Lugol's solution of iodine. The success of Professor Pancoast's cases did not make it a recognised operation by the surgeons of the country, but to Dr. Warren, of Boston, is justly due the credit and honour of making this operation an assured method of curing Hernia. In some cases the Hernia may return, but from my experience in this method I am well satisfied that fully seventy-five per cent. of all Hernias operated on in this way can be perfectly cured. Dr. Warren's position to this operation will be similar to that of the late Dr. Atlee to the operation of ovariectomy. These operations are two of the grandest achievements of surgery in the nineteenth century, and both by American surgeons. This patient that I show you has had right Inguinal Hernia for eighteen years, is a sailor by occupation, and is fifty years old. He was admitted to this hospital for medical treatment, and was transferred to the surgical wards, in order to have his hernia cured. I shall now use an instrument for this operation which was made for me by Mr. Gemrig, of this city, in April, 1869. It consists of a screw syringe so graduated, that when filled and ready for use, one quarter turn of the wheel will expel two drops of the fluid from the terminal end of the trocar. The trocar is a modification of Fitch's ovarian trocar. It consists of a hollow tube, that fits on the nipple of the syringe, and is about three inches in length, with a small orifice one-twentieth of an inch from the distal end; over this is a sheath or tube with a terminal point, similar to the cutting point of a hypodermic needle; this tube or sheath is somewhat shorter than the hollow probe attached to the syringe, and is fastened to the hollow probe

by a bayonet joint. The patient is now placed on the table, his hips slightly raised and the instrument properly armed with a concentrated aqueous extract of quercus alba. The cutting sheath is unlocked, and the point pushed forward, so as to extend about one-fourth of an inch beyond the distal end of the hollow probe, thereby closing the orifice for the exit of the irritant. This operation, not being a painful one, we will not give the patient ether. Taking the instrument in the right hand, with the left index finger I invaginate the tissue of the upper part of the scrotum, and insert my finger into the external ring. I find that the hernia and sac have been reduced with my left index finger in the external ring in front of the cord, and pressing upon the outer portions of the pillars. I now insert the cutting point along my finger, and the pillars of the ring; then with my right index finger and thumb I gently unlock the cutting sheath, and push the hollow probe into the inguinal canal, thereby, as you observe, retracting the cutting edge along the hollow probe. I now have the probe in the inguinal canal, and as it is a perfectly smooth probe it can do no injury to the cord or adjacent parts of the canal. I now gently push it up to the internal ring, and by one quarter turn of the wheel I deposit two drops of the irritant on the internal ring, and with the end of the probe I rub it around the edges of the ring. I also move it to another part of the ring and emit two more drops, and gently rub it around this part of the ring. I have now applied six drops of the irritant to the internal ring. I withdraw the instrument, and apply in the same way the irritant to the external ring; having now applied ten drops to the external ring, I pull out the instrument, and apply a pad over the parts, and a bandage. You observe that this patient has not complained of pain. He will be placed in the ward, and kept in a reclining position for the period of two weeks.

"February 6th—I have now the pleasure of showing you the

patient operated on in January for the cure of hernia. You notice that he walks around the amphitheatre without any sign of Hernia. We will test the cure, by having him stand upon this table and then jumping down; now by running up and down the steps, all of which has no effect upon the hernial rings. I think you may consider this man cured, but we will keep him under observation for some time yet.

“ May.—No sign of return of Hernia.”

Dr. Janney now says that hereafter in all his operations he shall in place of his syringe above described use my new instrument (to be described later on), as more effective, less dangerous, and in every way far preferable to any yet devised.

CHAPTER VI.

AUTHOR'S OPERATION BY INJECTION.—I. GENERAL REMARKS.

II. AUTHOR'S MODIFICATIONS OF THE INJECTION METHOD.

III. AUTHOR'S OPERATION.

FROM what I have thus far said it will be seen that all of the operations, from that of Chauliac to that of Wood, are severe, and likely to be attended with great danger of life, if not absolute loss of it. It is no wonder then that Bryant and others should in their surgeries express great dread of the many so-called radical cures, and doubt their expediency and their value.

No such arguments can be used against the operation that I recommend, as no fatal results have ever occurred in any of the operations performed by the various surgeons who have attempted them. Nor are such results at all likely to occur unless the operator unwarrantably interferes with the work of nature set up by the injection, unless he makes the injection in the most bungling and careless manner, or unless he uses some improper instrument, such as a scarf or lancet-pointed needle, as some few have proposed to use. The use of all such instruments has been severely deprecated for reasons which will appear later.

As regards the objection that is often made that all such operations which concern the peritoneum are dangerous I cannot do better than quote Dr. Davenport, editor of *Heaton on Rupture*: "Although allusion has been frequently made to the

necessity of much caution in practising this method for the cure of rupture, in order to avoid inflammation, the risk in this respect is in reality a very slight one. In the first place, the profession have laboured for years under a groundless fear of abdominal inflammation, because they have confounded inflammation of the parietal wall of the abdomen, which is generally easily controlled, and can scarcely be called dangerous, with deep-seated peritoneal inflammation of the abdominal contents. In the second place, as a matter of fact and experience, no inflammation does occur if the operation be performed with even a reasonable amount of skill. No surgeon after the experience of a few cases will be deterred from trying the operation because of apprehension of this danger, unless perchance he wishes blindly to adhere to his preconceived ideas, and rest content with the unsatisfactory and evasive practice of treating rupture by ordering a truss. Such advice is often almost like recommending a man with a broken leg merely to get a crutch." By this the reader must not understand too much. We do not mean to say that inflammation is not excited by our injection, but that *peritoneal* inflammation is not set up. The inflammation that we excite is local in its nature, and rarely extends beyond the crest of the ileum.

Upon this point Professor Wood says: "On reading over the opinions of modern writers on Hernia one cannot but be struck with the importance they attach to the supposed dangers of meddling with the peritoneum and its offsets. Around this theory are grouped most of the objections to operative interferences. The theory alluded to seems to have been deduced from experience of operations performed upon this membrane in a state of disease or inflammation, or operations exposing it extensively to external influences. Hundreds of operations involving the healthy peritoneum, both upon Herniæ and under other circumstances without bad results, have been overlooked

or ignored. This prejudice is, I believe, at the bottom of most of the objections, as it formerly prevailed against early operation in cases of Strangulated Hernia. In the latter cases it seems to have generally given way, rendering it more easy to be dealt with in the former class. In a general way, inflammation of a parietal portion of the peritoneum has been confounded with that of the visceral layer or general inflammation of the cavity near the important nervous centres. A secluded portion has been invested with the attributes of the whole, a logical error not uncommon." To illustrate this matter by practical cases I insert the following paper upon the toleration of the peritoneum to resist injuries.

This has been a theme of great interest, from very earliest times to the present, the older writers often feeling very timid in their treatment of any injury or wound, small or great, that should occur to the peritoneum, and giving almost always unfavourable prognostications, even in the slightest and most trivial injury to this membrane. In many cases, however, the more ancient mode of combating inflammation of all kinds, and particularly of this membrane, did prove fatal, no matter how assiduously the antiphlogistic treatment, internal and external, was applied.

We are taught, however, by more modern surgery, that by the application of water and by the internal use of opium and veratrum viride, under proper hygienic rules, serious injuries of this membrane are not only combated, but brought to a more favourable issue.

This has been illustrated in our civil contest, and other late wars. The great tolerance of the membrane has been still further illustrated by that honoured son of Kentucky, Dr. McDowell, and by Drs. Atlee, of Philadelphia, Peaslee, of New Hampshire, Spencer Wells, of England, and other ovariologists, as well as by Dr. Heaton, in his numerous injections for the

radical cure of Hernia. I have heard from Dr. Heaton's own lips that—and so we are led to infer from his published work—he frequently punctured the peritoneum, both in the umbilical and inguinal region.

To illustrate this tolerance more fully, I would here relate a few instances of the many injuries to this membrane that I have known :—

In my earliest years Mr. ——— called upon me. He had had the misfortune to receive a wound from a large rat-tail file, which struck him about three inches above the symphysis pubis. It punctured the superficial integuments and the bladder near its fundus.

Here, it is true, we had a favourable portion of the peritoneum wounded, as regards subsequent inflammation.

Although the man had acute cystitis from the injury, still, after the wound had discharged pus and urine for some time, he made a good recovery, without any peritonitis.

Another patient, in the year 1856, while in the delirium of fever, jumped from an attic window into the door yard, upon a stump covered with dry roots. As he fell he was impaled through the perineum to the rectum, and the walls of the abdomen were pierced in several places, just above the base of the bladder and the crest of the ileum, on the right side of the linea alba, by those small, dry rootlets, which were jagged and rough, and varied in size from a goose quill to half an inch in diameter.

Yet from all this serious injury, suffering as he was at the same time with typhoid fever, he made a good and successful recovery, suffering, however, for some months, from paralysis of the neck of the bladder.

Still further to illustrate, I will mention Mr. H., a case occurring in my practice on Christmas Eve, 1857. He was suffering from a wounded abdomen, which had been torn from the pubic

symphysis to nearly the ensiform cartilage, by a dull jack-knife used for the cutting of tobacco. From this wound most of the small intestines had escaped to the floor of a room covered with coal dust and the *débris* of a midnight carousal. After etherising my disembowelled patient, I passed the intestines through my hands, bathing off, with warm olive oil, the filth adhering to them, and closed the frightful wound by deep sutures and adhesive plaster. Over the abdomen I laid a cloth covering of cotton wool, and upon this placed a bladder filled with ice, which was frequently renewed. I placed the man in bed, administered thirty drops of laudanum and an injection to the rectum, and gave, I must confess, a most unfavourable prognosis. To my surprise, I found on my first dressing, forty-eight hours afterwards, that the wound had healed by the first intention, with no peritonitis or other intestinal or abdominal inflammation.

I may conclude these illustrations by mentioning a very remarkable case of rupture of the uterus, while in labour, and the escape of the child through the rent into the abdominal cavity. This resulted from a contracted pelvis. The woman had gone her full term, and the child, a large one, was extracted through the ruptured organ, a wound being made sufficiently large to admit the hand and arm of the gentleman with me, Dr. Benjamin Cushing, of Boston, so that I could feel his fingers and hand at the ensiform cartilage. You may judge of my surprise, when, on the following morning, entering the patient's room with my autopsy case under my arm, I found, not the fine subject for study which I had anticipated (but was happily disappointed in), but the patient sitting up in bed eating a bowl of gruel, and in the most cordial manner saluting me with the compliments of the opening day. This case was detailed at the time in the *Boston Medical and Surgical Journal*.

Suffice it to say that she made a rapid recovery, without

peritonitis, and in about the usual time as if she never had suffered from a ruptured uterus.

I therefore feel more confident at the present time, after the experience I have had, that if in any way, by accident, or in injecting, for cure, the hernial rings, whether in umbilical, inguinal or femoral, I pierce this membrane, unfavourable results will not necessarily occur. As yet I have never had a fatal result in any of the cases where I was led to suppose that I might have punctured the membrane. I would not, nor would I advise any one to puncture the peritoneum, however, if it can possibly be avoided.

I am a firm believer, as you may infer from reading these cases, in the application of cold water or ice, either in rubber bags or in bladders. I have never seen a case of peritonitis, arising from any injury, that was not followed by favourable results if these means were used to allay the inflammation, and I have yet to see a case requiring the application of poultices or hot fomentations to bring about such favourable results.

These applications of poultices for abdominal inflammations involving the bowels, peritoneum, and the uterus, have been, I believe, the bane of surgical treatment by ancient physicians, and by some physicians of the present day. They are unnecessary, unless there has been an open wound and suppuration, and even in these cases a large majority, I think, would be better cured by the applications of cold, either dry or moist.

I can conceive that there may be some exceptions to the universal use of these cold applications, and in these cases hot stupes of terebinth and opium combined with chloroform might be useful, as, for example, in the puerperal diseases of women, involving the uterus and its appendages, and attended with great tympanitis, and also in the tympanitic condition of enteric and gastric fever. Still I think it will be found that in very many of these cases the water or ice bags will be of the greatest

benefit in a successful treatment of all these inflammatory actions. At least I have so found it in my practice, and I moreover prefer the ice in a bladder to that in a rubber bag, because the tissues of the body take more kindly to an animal tissue than to a smooth, clammy, rubber surface.²⁵

Every surgeon who has had much to do with operations and wounds in the abdominal muscles and integuments, particularly in the inguinal and pelvic regions, must be struck with the vast amount of sero-plastic lymph poured out from any injury or wound of these parts. Even in the application of a blister to this portion of the body it will be noticed that we have a far greater amount of serum poured out than we do when one is placed upon almost any other part of the body.

In the injections into the hernial rings, for the cure of rupture, we take advantage of this, and in some cases we may have a full occlusion of the hernial rings, even after we have partially divided some of the muscles and ligaments for the release of the strangulated intestine, and we obtain a far more favourable result than perhaps might be reasonably expected from so severe an operation. This takes place from the adventitious tissue formed by the serous lymph, and from the cicatricial contraction of the wounded muscles; hence any irritation of these fibres, fascia lata, &c., by means of astringent fluids injected upon them, will be found to produce a free effusion of this lymph, which soon becomes organised, and unites the oblique, internal and external, transversalis and transversalis fascia, and so forth, fully together. The greater the amount of serous effusion, the more sure are we of obtaining this desirable result in the radical cure of Hernia.²⁶

I have become so familiar with this condition and abundant effusion, that I can usually judge whether I shall get an occlusion and union of the parts of the hernial rings in my operation for the cure of rupture, in the course of forty-eight

hours. After I have operated, should the effusion be slight, I do not anticipate a very satisfactory result, but, on the contrary, if it be abundant, I look, and generally not in vain, for a most favourable and permanent cure of the Hernia.

AUTHOR'S MODIFICATIONS OF THE INJECTION METHOD.

Having advanced thus far in our subject, I will, before describing the exact *modus operandi* of my improved operations, give a brief account of the way in which I was led to improve the instrument and fluid used by Dr. Heaton, with some remarks upon the proper and improper instruments used in the operation.

I began operating for the cure of Hernia soon after the death of Dr. Heaton.

The first patient was Mr. G——, aged twenty-three, with double direct Inguinal Hernia. I was assisted by Dr. Wm. Emery, of Boston, who was his physician at the time of the operation. The hernial ring on the right side had become dilated to the extent of about one and a quarter inches in diameter by the protrusion of the hernial sac and intestine. The hernia on this side had existed for over two years, and the tumour formed by the hernial protrusion was about the size of a goose-egg. The Hernia upon the left side had existed for about a year and a half, was about one inch in diameter, while the hernial protrusion was about one-half the size of the one on the right side. These herniæ being at times very painful, and almost impossible to be retained with the ordinary truss during the patient's daily labour, it was thought best to perform the Heatonian operation for hernia, which was done in the following manner. With the old instrument of Dr. Heaton, I injected on the right side about twenty minims of the fluid extract of quercus alba, which had been evaporated to the consistency of glycerine, and united

with an eighth of a grain of morphine; on the left side about fifteen drops.

In about six hours after the injection the patient began to grow feverish and restless; pulse running to about ninety, temperature about one hundred. This condition continued for about three days, when it began gradually to subside. The urine was passed naturally, and a natural passage of the bowels took place on the sixth day. There was some swelling and redness over the hernial ring, extending up over the abdomen obliquely to the crest of the ilium. Dr. Emery attended the case, I seeing the patient occasionally. He administered one-eighth of a grain of morphine at bed-time to secure rest, and cold water was constantly applied over the seat of operation by means of a compress. A rapid and successful recovery took place, with a perfect cure of the Herniæ, and on the twenty-third day of



FIG. 31.—Heaton's Instrument, with Davenport's Needle.

July the patient came to my office, when a temporary truss was ordered. This he was to wear for several months until we should conclude that the tissues had gained sufficient strength for him to dispense with it.

It will be seen from the nature of the case that I here felt obliged to use a much larger quantity of the extract of *quercus alba* than is recommended by the late Dr. Heaton in his work on the cure of rupture. The instrument, Fig. 31, too, with which he performed his operations, I found very much worn from constant use in his practice for the last thirty years, and very unfit for the purpose for which it was designed, since great manipulation was required to exclude the air from the barrel of the syringe, because of the loose and worn packing. The needle was pierced for the exit of the fluid with two small

holes about one-fourth of an inch from its point. In order, therefore, to apply the mixture thoroughly to all the circumference of the ring, internal and external, it was necessary to twist the needle around during the injection. The fact is, however, that this method of operating caused a very unequal distribution of the fluids upon the parts, and much pain and needless suffering to the patient.

I examined also the needle devised by Dr. Davenport, editor of *Heaton on Rupture*, and found his likewise had but two openings, with what I consider a very dangerous point, it being lancet-shaped, and liable to pierce the pubic and branches of the epigastric arteries, together with other vessels. It thus had not even the merits of Dr. Heaton's old needle,¹ which was in shape not unlike a bradawl at its point, and which, because not very sharp, easily glanced by any vessels it might meet in its passage through the integuments.

Accordingly, in my next case I had a needle made for me and pierced with four holes, the first two much nearer the point of the needle than in the old instrument. This new needle, I found, worked very much better, distributing the fluid more equally upon the internal and external ring, together with less turning of the needle in the integuments and consequently much less pain in the operation. With this needle, as I had improved it, I continued to perform several operations with much better success than with the needle devised by Dr. Heaton. Still when I came to operate for a very large double inguinal hernia, one direct and the other oblique, the distance through the integuments being greatly increased by adipose deposit, I found there was still a great amount of pain which I thought unnecessary, produced by the instrument—since, being rather blunt at the point, it met with considerable resistance in penetrating the tissues.

¹ See Fig. of Heaton's case, p. 370.

When I came to make a second injection, which was necessary on the left side of this hernia, since the first injection did not succeed in causing the adventitious tissue to be thrown out so as fully to close the ring, I found much greater resistance in the integuments than before, they having become more firmly consolidated from the effect of the oak bark. The operation thus caused considerable pain, although no more than most patients could endure without etherisation.

I next turned my attention to find some means of penetrating the tissue into the hernial ring with less pain, and for this purpose devised a new instrument, Fig. 32. It consists of a glass barrel inclosed in silver, through whose fenestrated openings the fluid

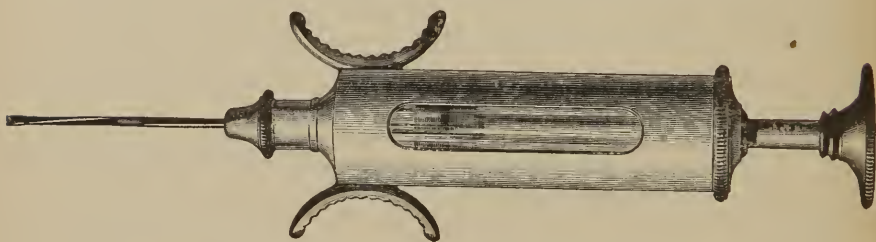


FIG. 32.—My First Instrument, with Revolving Needle.

can be seen and the presence of air-bubbles detected. The number of minims is also plainly indicated on the engraved glass barrel, so that we can measure the exact number of drops injected in any given operation. It has two semicircular handles on the lower end for holding the instrument conveniently and firmly during the operation.

If we next examine the needle or beak, we shall see that it is hollow, about one and three-quarter inches long, and that throughout its whole length it partakes of a spiral twist, so that it will, of necessity, revolve as it enters the tissue, and by such revolving penetrate the skin and other integuments much more readily than is possible with a straight, bluntly-pointed instrument. We can readily illustrate this by passing the improved

needle through a piece of parchment, and then by performing a similar operation with a straight needle pointed like a brad-awl. The ease with which the fine needle penetrates, compared with the resistance which the other meets, proves conclusively that the former instrument must do its work with much less pain than the latter. The secret of this is that with the straight needle we get constant friction and bearing on the entire length of the needle during the whole operation, whereas with the spiral form of the needle the friction and pressure are on but a small portion of the body of the instrument at any one time, and are thus reduced to the minimum.

Then, again, it is to be observed that the needle, instead of being round, is of a flat, oval shape, and makes a wound of the same form. In this way there is a more ready coaptation of the wounded tissue than would be possible with a round puncture. The needle is pierced with ten openings upon its sides, which causes a more free and equal distribution of the fluid ejected. The difference between this and the hypodermic needle, which I shall speak of later on, is that, instead of the direct terminal uses of the fluid, we have it spread at right angles to the needle, and therefore gain a better distribution upon the hernial rings, internal and external, at the same time avoiding the application of the fluid to the peritoneum which we wish to irritate as little as possible.

With the hypodermic syringe, however, the principal flow of the fluid would be upon the peritoneum, and not upon the parts intended to receive it, thus making the operation, in view of the small amount of fluid recommended, of limited and doubtful success. If we examine the attachment of this needle to the barrel of the syringe, we shall see that the needle is held in place by a coupling and collar, which allows it to revolve while on its passage through the integuments.

The head of the needle within this collar is rounded something

like the smaller end of an egg and on its bearings is in contact with a diamond or other hard stone which is concaved to fit accurately the convexity of the needle. In this way we avoid almost entirely the friction which would, if metal met metal, prevent the free revolution of the needle; and at the same time we render the joint sufficiently tight to prevent all leakage of the fluid as it passes from the chamber of the instrument into the needle.

Some improper instruments having been used in this operation I have to make the following general and important criticisms upon all sharp-pointed needles, like that on Fitch's trocar which has been used for the purpose, or like that devised by Dr. Janney of Philadelphia, previously described.

I do not wish to be considered an opposer of any other gentleman; on the contrary, nothing pleases me so much as to have others do this operation successfully. When, however, they attempt to do it, I do hope that they will select a proper and safe instrument to work with. If any one can devise a better instrument than has been devised, I, for one, should be happy to have him do it, and shall be happy to use it. But I hope they will be sure that it is safe, and that it gives honour to the good name of the operation, before they make it public as an improvement on both Dr. Heaton's instrument and my own, which are already in successful use. Therefore, as the only living man whom Dr. Heaton ever personally taught the operation as it was performed by him, I protest, in the name of humanity, against the use of any sharp, or angular-pointed needle in the operation, and I emphatically warn the profession to expect many unfavourable and even dangerous results from the use of such instruments; results which probably might have been a successful cure had proper instruments been used.

Lest the profession should consider me over cautious in this matter I will refer to an incident during a recent visit I made

to New York. Dr. Post desired me to go to the Presbyterian Hospital to see a patient he had operated upon for Hernia, but in whom he had not ventured to make the injection from the surface, for fear of injuring the arteries and other vessels. He had therefore first cut down upon the rings with the scalpel, freely, and then injected. He was in dread of these sharp-pointed instruments, but thought my new-pointed instrument avoided the difficulty. If this skilful and veteran surgeon, famous for his successful operations, dreaded and did not dare use a sharp-pointed instrument, how much more should the mere tyro in surgery avoid their use? It is impossible to be too cautious in this region so rich in surgical anatomy.

In addition to this it should be stated that in my method of performing the operation, instead of applying the fluid to the internal hernial ring first, as in Dr. Heaton's operation, I reverse the process and do this last; for as soon as my needle has penetrated the tissues, I immediately begin to eject the fluid upon the external ring and its surrounding parts, and so continue until I reach the internal ring. After sufficiently bathing the latter with the fluid I withdraw the instrument, still continuing to eject.¹

In performing in this manner we complete the operation in one half the time employed by Dr. Heaton, and, comparatively speaking, with an absence of pain. At the same time we entirely avoid the sweeping motion of the needle described in Dr. Heaton's treatise, a process which I consider very much endangers the wounding or irritation of the muscular fibres and blood-vessels composing the rings.

Furthermore, the tissues being less likely to be serrated or irritated with my needle than with his, there is much less tendency to the formation of abscesses from such irritation than in the old operation.

I find, too, that the extract of oak bark employed by Dr.

¹ See pp. 170, 383.

Heaton is not well held in solution, being liable to much sediment, the powder forming granulations which do not readily pass through the syringe, and which, if ejected, form a considerable irritation, and therefore a great tendency to abscesses. A better and safer formula is to evaporate the fluid extract of oak to about the consistency of glycerine, add sufficient absolute alcohol to reduce it about one half, and then add about one half a dram of sulphuric ether to the half ounce of fluid. To this mixture I also add about two grains of sulphate of morphia, thus making one of the most perfect injecting fluids that I have thus far been able by numerous experiments to devise, combining the astringent effect of Dr. Heaton's extract of quercus alba, together with that of the German method of using alcohol alone, and producing the most favorable results in this operation of injecting the hernial rings for the radical cure.²⁷

The use of an ordinary hypodermic syringe would be, I consider, an operation attended with much danger, not only from the liability of penetrating a portion of the pubic and epigastric arteries, but also because the instrument would be a poor and feeble one for thorough and successful operations on Hernia, since it is well known that the needle has to act in some degree as a staff and guide in slightly lifting up, as it were, the integuments, which are often thick and supplemented by excessive adipose tissue.

I hardly need call the attention of any surgeon of prominence who keeps well up in the anatomy of these parts to the great danger of wounding the epigastric and pubic arteries, and other blood-vessels and nerves, by a sharp lancet or angular-pointed instrument. The cautious surgeon well knows that his patient might easily receive a dangerous wound here and bleed to death, perhaps, before it be discovered and secured. Hence, after what is known and has been said on the subject, a hypodermic syringe, or any thin and sharp-pointed instrument, will







PLATE C. INGUINAL AND CRURAL CANAL.

(*Seen Outwardly.*)

FROM BLANDIN.

EXPLANATION OF THE PLATE.

A. Portion of the thigh. — B. Penis. — C. The testicles. — D. Hair of the pubis. — E, E. Portion of the anterior abdominal enclosure (*costo-iliac region*). — F. Anterior and superior iliac spine. — G. Right muscle in its sheath. — H. Pyramidal muscle equally in its sheath. — I. Aponeurosis of the great oblique. — J. Hook which lifts up a portion of the aponeurosis of the great oblique, detached over the crural arcade, where it forms the anterior enclosure of the inguinal canal. — K, K. Crural arcade. — L. Inguinal ring crossed by the testicular cordon, and sending from its circumference a fibrous expansion upon the cordon. — M. Fibrous expansion detached from the circumference of the inguinal ring. — N. Internal or superior pilaster of the ring. — O. External or inferior pilaster of the ring. — P. Place where the crural arcade continues with all the thickness of the fascia lata aponeurosis. — Q. Place where the crural arcade adhered only to the superficial leaf of the fascia lata aponeurosis leaf, which here has been detached and overturned outside. — R. Sinus, open in the upper part, which the crural arcade forms in continuing backwards and above, with the fascia transversalis sinus which constitutes the inguinal canal. — SS. Fascia transversalis aponeurosis, which forms the posterior enclosure of the inguinal passage, in a place where of the three muscles of the abdomen only the external oblique one is found. — T. Place where the fascia transversalis aponeurosis rises from the external edge of the right muscle. — VVV. Inferior edge confounded and horizontally directed from the small oblique and transversal muscle. — V, V, V, V. Muscular handles of the cremasterous muscle formed by an emanation upon the cordon of the inferior edge of the small oblique and transversal muscles. — X. Testicular cordon, in the middle of which are seen the flexuosities of the testicular veins. — Y. Iléo-scrotal nerve of the lumbar plexus. — Z, Z, Z. The adipous skin and tissue of the abdominal enclosure, turned down. — &. Fascia superficialis aponeurosis. — a. Cordon knotted upon the fascia superficialis aponeurosis, detached from the abdominal enclosure, and overturned upon the thigh and hip. — b, b, b. Tegumentary vessels of the abdomen. — c. Genital external superficial vessels. — d, d. Anterior enclosure of the crural canal, cut and overturned from inside to outside in order to show the crural canal. — e. Large lymphatic ganglion, placed before the crural canal. — f, f. Openings of the anterior enclosure of the crural canal, which are crossed by lymphatic vessels. — g. External enclosure of the crural canal, formed by the deep leaf of the lata fascia, supported upon the psoas and iliac muscles. — h. Opening made to the external enclosure of the crural canal, in order to show the crural nerve placed immediately outside of it, in the sheath of the psoas. — i. Femoral artery, placed outside of the vein of the same name. — j. Femoral vein placed within the artery. — i. Internal sapheneous vein. — m. Inferior opening of the crural canal, crossed by the internal sapheneous vein. — n. Fibrous falciform bunch, placed at the confluence of the sapheneous and femoral veins.

appear extremely dangerous to most successful surgeons. I should suppose there was hardly a single maker of surgical instruments who would be a party to the manufacture of any such dangerous instruments, and much less that there was any surgeon who would attempt to use such foul implements on any human being.

Indeed, one of the many reasons why Dr. Heaton preferred a needle like a bradawl, with a round and somewhat blunted point, was that it would easily and safely glide off the coats of the vessels. In my instrument I further guarded against danger by a round and blunt-pointed needle, which would revolve in penetrating the tissues. In this way there is still less danger of wounds or unnecessary irritation than in Dr. Heaton's method of sweeping the needle around, so as to distribute the fluid equally upon all the parts. With my instrument the fluid is simply and completely distributed around the rings and canal during the act of entering and withdrawing the instrument, and there is no possible danger of injury to the parts during the operation.

There has been some misunderstanding too about the manner in which the injection should be given. From an ordinary hypodermic syringe the fluid will be injected straight forward, while Dr. Heaton strove to force his fluid in a *spray* at right-angles to the needle. This is an essential point in the operation, since it is the *hernial rings* and not the hernial sac that we desire to irritate.²⁸

Although it is high time that this operation should be better understood, still a thorough comprehension will neither lessen our great esteem for the more formal surgical operation for Strangulated Hernia, as now performed by all modern surgeons, nor will it be less essential for all practical surgeons thoroughly to understand this latter operation.

So long, however, as thousands upon thousands are ruptured

with reducible Herniæ, which have heretofore required all the ingenuity of mechanical art to support and retain within the abdominal cavity by bands of iron and steel, elastic fabrics, bone and ivory thereby endangering life by their liability to become strangulated, and often abruptly terminating existence by the strangulated intestines becoming sphacelated and gangrenous, before relief can be obtained by the surgeon's knife, or the more gentle operation of taxis; so long as this is the case, the discovery of a permanent cure seems a most wonderful blessing for mankind.

Should I ever be disappointed in the success of this operation for the relief and cure of rupture, I should be the first to acknowledge it.

Allow me to add, I know of no operation in the annals of surgery that requires a more delicate touch, and finer manipulation in all its details, or a steadier and firmer hand in the operator, not even excepting the fine and graceful operation of cataract on the eye. What operation demands more care than passing a sharp-pointed instrument through the living tissue into the hernial ring, among numerous tissues, vessels, nerves, and surrounded by the peritoneal membrane? I know of no operation more simple and painless, or that brings forth such rich results in relief, comfort, and almost certain cure in nearly every case when performed by a skilful operator, than this one for the cure of rupture. But when awkwardly and indifferently performed by one deficient in the anatomical and surgical knowledge proper for the undertaking of the operation, I know of no operation so fraught with danger to human life, and one so barren in results, and therefore disappointing to both physician and patient.

In regard to the duration of the after treatment, my experience has been, and it was the experience of Dr. Heaton, that the effusion of plasto-lymph around the parts is not sufficiently

organised in five or ten days after the operation into adherent and fibrous tissue, to bear any strain at all upon them. They would at once separate and give way. Dr. Heaton caused his cases to remain at rest at least ten or twelve days. That we know from his experience, and I can say the same has been the case in my experience.

Finally, I wish to add a word of caution and advice to those who may have to do with this operation. Should the patient get up too soon after being operated upon, or make any undue exercise or exertions before the parts have acquired sufficient union, consolidation, and firmness, they will very readily become separated, and of course let the Hernia escape again; or, should there be union in the parts sufficient even to retain the Hernia within the abdominal rings, yet a secondary swelling may again appear in the track of the first swelling and inflammation which usually attends the primary operation.

This secondary swelling, more particularly if it follows after we have made two or three injections, which are often found necessary fully to close the hernial rings, will appear in any form of Inguinal Hernia very prominent over the seat of the injected parts, not unlike an inverted common saucer in size and appearance, extending along the oblique to the crest of the ilium, and will assume a dark maroon colour. If we now examine it, it will appear to the touch as though fluid or pus were present.

This is not, however, the case; it is only a slight effusion and exudation of plasmatic serum, together with some mingling with the discoloration produced by the extract of oak injected. If now we cut freely down, exposing these parts to view, we see that the tannin in the mixture injected has united with the exudation, causing the appearance of the tannate of albumen. This will show itself by the striated, shroudy, and granulated substance resembling dry blood when moistened again. If we should now constantly apply compresses of cold water and

allow the patient to remain in bed, on his back, this redness and swelling will generally, in the course of two weeks, entirely disappear.

Such cases, when fully over all inflammatory attacks, will be found to be stronger in the hernial rings than those which had only the primary inflammation following the injection, because this secondary inflammation more fully unites the parts inflamed by thickening an additional deposit of organised lymph over the seat of the operation. But we should not be misled by this inflammation and proceed at once to open this large swelling, as we thereby very greatly endanger the result of the primary operation for the relief of the rupture, and put the patient's life in great and needless danger.

We should patiently wait, and after a sufficient time, it will, if it be an abscess, converge, in the course of ten or twelve days, to about the size of a Seckel pear, and something like it in shape and appearance. Then, and not until then, we should proceed to open the swelling, and even then we should first be able to feel the fluctuation of the pus through the thinned walls of the abscess. And if still in doubt, from our diagnosis, whether it be an abscess or not, we should, before opening, pass into the swelling one of the finest needles of the aspirator.

Cold water is the best dressing, and all through the treatment, from the very beginning to the perfect recovery to the normal condition of the inflamed parts, neither lotions nor ointments are required.

Now, sometimes when we discharge a patient after this operation, he is commanded to wear a truss or bandage, not to lift or jump either from the cars or any other height, and to be very careful about any violent exercise whatever; all of which he promises to do. But the person so dismissed, cured to all appearances, will possibly feel so mighty and proud in his recovery that, although he may for a time follow the instructions,

he will some fine morning cough, perhaps, and force the abdominal parts down in order to see how strong he is in this region ; or taking a peculiar delight now in examining what previous to the operation was so repulsive, he will try to lift a heavy weight, pull a hand-cart if he takes a notion, or see how high he can reach.

From these self examinations he may feel satisfied that he is perfectly cured, and yet, in the very acts in the time of his unusual exertions, he has started and opened the adhesions formed in the hernial ring, and in the end his state will be nearly as bad as before ; for upon the least yielding of these new adhesions the peritoneum and intestines will insinuate themselves through the most minute opening, and act like a wedge in forcing the parts asunder.

Had he been more cautious in following explicit directions, and waited a year or two before making violent exertions, he would never have had to bear a return of his rupture. Should a return of his Hernia unfortunately take place, another operation and injection will generally effect even a firmer closing of the rings than the first operation did, because of a decidedly greater condensation and stronger cohesion of the parts treated. But I am assured that he never again, in his joy, will experiment to see how perfectly he is cured.

Sometimes, after the hernial rings are closed, as Dr. Heaton says in his work, and as I myself have seen, portions of the hernial sac, particularly in cases of long standing, are fastened down in the folds of the rings and surrounding parts, after the operation for cure has been successfully applied, and this may lead the patient—nay, even the physician—to think that the hernia has not been in reality cured. If, however, as I have already said, the rupture remains closed for a year or so, the cure may be looked upon as certainly a permanent one.

Suppose, however, that this hernial sac can be passed readily

through the hernial rings, then a very slight amount of the injection will close the parts efficiently, leaving the patient much strengthened by the operation.

I wish to call attention again and especially to the fact, that although this operation is generally successful upon its first performance, yet it has sometimes to be repeated several times before we get a full and strong occlusion of the rings, particularly in herniæ of large and long standing. If, after we have once operated and have succeeded in partly closing the opening, we find we have not done it so as fully to effect a permanent cure, we must, after the lapse of eight or ten days, repeat the operation, and continue so to do until we have entirely closed the parts beyond danger of opening. Thus, by perseverance, and thus only, we shall in the end be delighted and rewarded by the perfect cure of almost every case we undertake.

Even after the patient has returned to his usual occupations, and has seemed, both to himself and the operator, cured, upon the slightest indication of the return of his troubles he should at once present himself for examination, and, if necessary, another operation. Indeed, not only in this operation, but in all others in surgery that may be presented to me for treatment, I could not positively, and under all circumstances, warrant a permanent cure any more than if I performed ovariectomy or the amputation of a limb, for it is well known that from some unforeseen circumstances in the operation, or in the conduct of the patient submitted, success may not always and with certainty follow a good and legitimate attempt at relief.

AUTHOR'S OPERATION.

With all due deference to the many and honoured operators for the cure of Hernia, I now give my *improved* operation, with a description of my new instrument and injecting fluid. While

I make no claim to originality beyond whatever originality is required to perfect and bring to a scientific development what before, in a crude and imperfect form had worked many good results, I am encouraged to present whatever I have done because of the very general interest shown by the profession in my own country and in other countries, in what I have already given them in the medical journals. My method of performing and presenting the operation would seem to be more acceptable to the better and greater part of the profession than previous operations, if I can judge by the letters of congratulation I receive from distinguished surgeons of this and other countries, fully approving the operation as safer and freer from all following complications than any operation heretofore proposed. Thus far I have not had a single fatal case, and the worst case I have had was an old congenital hernia cited in the report of interesting cases (see p. 192, operations 3, 4, 5) read before the Suffolk District Medical Society.

The operation is here given with some slight increase of matter, being nearly as read before the British Medical Association at Cambridge, 12th August, 1880; and presented before the Académie de Médecine, 31st August, 1880.

It gives me great pleasure to have the honour of addressing you at this, the annual meeting of your venerable Association, on the treatment of Hernia by a new method, by means of an instrument and injecting fluid of my own devising.

As many of you are aware, I have written considerably on this subject, and by means of the various medical journals, the so-called radical cure of rupture has been circulated through the medical profession, and caused no little interest. But I do not like the term "radical" as applied to this or any other operation, for it is not euphonious, and is distasteful to the true surgeon, sounding as it does of charlatanism. It sounds unprofessional to all preconceived ideas of medical and surgical

science, and in my humble opinion it should not be so much as named among us in speaking of this or any other operation. Let us in speaking of this operation call it by its true name, an operation for Hernia by injecting the hernial rings.

I am aware that some of the most honoured men that have brightened the pages of surgical literature or taught in our Universities have applied the term radical to the operation for Hernia, but notwithstanding this I would take exception to the time-honoured precedent, and in accordance with the present spirit of medical and surgical art, call this operation by its true name, trusting that we shall be quite as successful in curing and relieving our patients as we should under the irregular name of radical cure. In all my future papers and work upon Hernia I will join hands with the profession and erase the objectionable word, and will speak of treating and curing ruptures by this method as we do of any operation devised for the cure of any affection.

I would here take the liberty of expressing at this time my most sincere thanks to the distinguished profession of London, New York, and Boston, as well as to the profession generally in my own country and Europe, for their kind criticisms and consideration of me in presenting my imperfect papers on Hernia, which are given while engaged with many cares incident to an active professional life.

In presenting this paper, I wish to say here that in giving my new instruments and method to the profession I do not wish to detract any credit from the late Dr. George Heaton, of Boston, nor underestimate his valuable work on rupture, nor the great labor and pains of his late co-editor, the refined and scholarly Dr. Davenport.

On the contrary, I look up to Dr. Heaton, not only as my former master and instructor in this operation, but as one from whom I gained all my inspiration for my present and future

efforts in developing and demonstrating this, as yet, as I feel, imperfect operation on Hernia. To Dr. George Heaton will always belong the honour of first injecting the hernial rings with fluid extract of oak bark, *Quercus alba*, for the radical cure of rupture, if he was not the first to inject hypodermically.

I am, as will be seen, working over the field of operation of Hernia, trying to perfect and improve any deficiencies which I find in the treatment by injections, and it will be my greatest desire to be candid and truthful in all that I do and present to my medical brethren; and may I not hope with their kind assistance to accomplish much in this operation, which does not as yet seem to be fully understood by the profession or appreciated as it properly should be?³⁰

The following is a short description of new syringe and instrument for injecting the hernial rings in the cure of Hernia.²⁹



FIG. 33.

The instrument which I show you consists of a barrel, A, holding about sixty minims. This barrel is of glass, accurately fitted within a cylinder of silver, which is fenestrated with two openings to present a view of the barrel and its contents. The barrel is graduated, each degree indicating ten minims. The piston B works by a spring C, very tightly, within this tube, so as to exclude all air possible. The lower end D of the piston is slightly concaved. At the bottom of the interior of the glass barrel there is a ring E, one-eighth of an inch in thickness, made of soft rubber, for an air chamber, with a hole in its centre for the exit of the fluid.

On the lower exterior end of the barrel will be seen a convenient semi-circular handle, with the concave side roughened to give a firm hold for the finger and thumb of the operator.

A valve is situated just below the bottom of the barrel and rubber chamber, and is opened and shut by pressure on the lever *c*. We thus have perfect management, both of the amount of the fluid to be injected and of the time when it shall be injected. Below this valve is a diannond, or other hard stone, concaved to fit exactly the convex head of the needle which plays upon it.

The needles are flattish, oval in shape, and are twisted throughout their entire length. They are of three sizes. No. 1 is one and a quarter inch in length, size two and a half American scale; No. 2 is one and three-eighths in length, size two and three-quarters American scale; No. 3 is one and a half inch in length, and size three. It should be remembered that, from their peculiar form and twist, they make an incision only about one-half the size of round needles which measure the same on the scale. The twist of the needles also varies. No. 1 is twisted to revolve once in penetrating one-fourth of an inch, No. 2 once in penetrating one-half an inch, and No. 3 once in penetrating three-quarters of an inch. I use No. 1 in operations on umbilical Hernia and other Herniæ where the tissues are thin. It is therefore small, and has a quick twist because it is necessary that the needle in penetrating should make a full revolution, so as to distribute the fluid on the parts to be irritated by the injection. No. 2 is for use in operating on the majority of small and recent Herniæ. No. 3 is for use on large and long-standing ruptures, where the needle must traverse tissue generally much thicker than in the other cases mentioned, and often surrounded by adipose deposit. The needle has a round shank, playing through a collar, which is

attached by a screw thread to the neck of the barrel. This needle does not bore in passing, but turns round in a spiral manner as it advances, and the same can be said of all the other instruments to be hereafter described, except the aspirating needle, which is twisted in through the tissues by slight pressure and revolving it at the same time.¹

I have said that there was a rubber cushion at the bottom of the glass tube. This cushion remedies the defect common to hypodermic as well as all other syringes, for it forms an air chamber which arrests the passage out of any air that may be in the barrel, and there is always more or less which would be injected with the fluid. It also acts very effectually in stopping the farther action of the piston after all the fluid has been injected.

The method of using the instrument is as follows. With the valve closed, the needle is inserted in the fluid to be used. The valve is now opened by slight pressure upon the lever. The pressure being continued, the piston can be retracted, and the barrel will be consequently filled with the fluid. The valve is then allowed to close, and the instrument is charged for use.

Having selected the most suitable point over the rings to be injected, we now thrust the needle slowly and gently, but at the same time firmly, through the integuments. During this act the needle revolves because of its twisted form. As soon as it has passed through the integuments, pressure is made upon the spring, which opens the valve, and allows the fluid in the barrel to flow as slowly and in such quantities as the operator may in any given case think necessary. The quantity used can, of course, always be known by the engraved scale on the barrel.

¹ See First Edition.

ANATOMY OF FEMORAL AND INGUINAL HERNIA.¹

The real and essential anatomy of the parts where our seat of operation lies, we find to be the following:

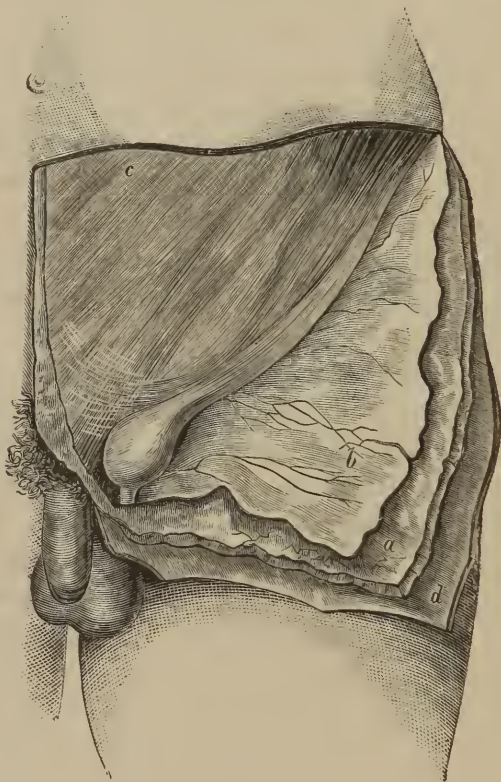


Fig. 31.

Shows the anatomical relation and coverings of Oblique Hernia. *b*, transversalis fascia; *c*, peritoneum; *a*, muscles, internal oblique transversalis, and external oblique; *d*, external integuments. These illustrations were drawn under Mr. Cooper's directions from my friend Mr. John Wood's work on Rupture, who very kindly permitted me to make use of them for this work.

The inguinal or spermatic canal begins at the internal abdominal ring, its length being about one and a half inches. It

¹ See p. 51.

serves for passage of the spermatic cord in the male and the round ligament with its vessels in the female. Its boundaries are :

In front—Tendon of external oblique muscle, lower border of internal oblique and a small portion of the cremaster muscle.

Behind.—Fascia transversalis, conjoined tendon of internal oblique and transversalis muscles, and the triangular fascia.

Above.—Arched border of transversalis muscle.

Below.—Poupart's ligament.

This inguinal canal is of great surgical importance on account of its being the channel through which inguinal Hernia escapes from the abdomen. Inguinal Herniæ are of two kinds, oblique and direct. The former enters the inguinal canal through the internal abdominal ring, passing obliquely along the canal and through the external ring to descend into the scrotum. Direct inguinal Hernia escapes from the abdomen at Hesselbach's triangle and passes through the external ring.

Hesselbach's triangle is situated at the lower part of the abdominal wall on either side. Its boundaries are :

Externally.—Epigastric artery.

Internally.—Outer margin of rectus.

Below.—Poupart's ligament.

The following are the coverings of the two varieties of inguinal Hernia, commencing at the surface :

Oblique.

1. Skin.
2. Superficial fascia.
3. Intercolumnar fascia.
4. Cremaster muscles.
5. Fascia transversalis.
6. Sub-serous cellular tissue.
7. Peritoneum.

Direct.

1. Skin.
2. Superficial fascia.
3. Intercolumnar fascia.
4. Conjoined tendon of internal oblique and transversalis muscles.
5. Fascia transversalis.
6. Sub-serous cellular tissue.
7. Peritoneum.

FEMORAL HERNIA.¹

The crural or femoral canal is a funnel-shaped interval which exists within the femoral sheath between its inner walls and the femoral vein, and is the space into which the sac of femoral hernia is protruded. It is limited above by the crural or femoral

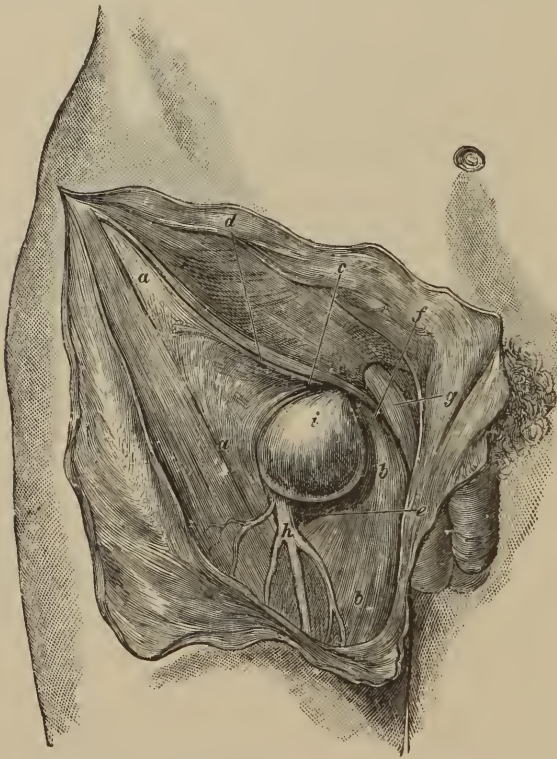


FIG. 35.—Femoral Hernia.

For description of plate, see Fig. 52.

ring and is lost below by the adhesion of the sheath to the coats of the vessels. In the normal state, the canal is occupied by loose cellular tissue and numerous lymphatic vessels, which perforate the cribriform fascia covering the saphenous opening in the

¹ See p. 66.

fascia lata and the walls of the sheath, to reach a lymphatic gland situated at the crural ring. This gland is retained in its position by a thin layer of sub-serous cellular tissue—septum crurale—which together with the peritoneum separates the canal from the abdominal cavity. The crural ring is, the point where femoral Hernia leaves the abdomen, and is the most frequent seat of strangulation. Its boundaries are :—

In front.—Poupart's ligament.

Behind.—Ileo-pectineal line, and body of pubic bone.

Externally.—Femoral vein.

Internally.—The sharp margin of Gimbernat's ligament.

The coverings of femoral Hernia commencing at the surface are :

1. Skin.
2. Superficial fascia.
3. Cribriform fascia.
4. Femoral sheath or fascia propria.
5. Septum crurale or sub-serous cellular tissue.
6. Peritoneum.

THE POSITION FOR OPERATION IN THE CURE OF HERNIA BY SUBCUTANEOUS INJECTIONS.

I have often done this operation on a table made of white wood, for the sake of lightness, about six feet long and one foot wide. It is supported by three pairs of legs, which at the foot are two feet four inches high, and at the head two feet high, while the central ones are nineteen inches high. These legs diverge from the middle line of table to give the greatest possible stability.

There are four leaves attached to the top of the table, two on either side ; that is, each leaf is about three feet long and six inches wide. The two leaves at the head of the table are spread open for the patient to lie upon, while the two at the foot are allowed to hang at the sides of the table. On these latter

leaves is placed a foot-rest for the patient, so that his limbs may be in a proper position for a convenient operation. These leaves, as well as the legs, are hinged to fold up, and are properly braced to be held in position during the operation.

The table has in its centre, and about three feet from the lower end, an oval opening six inches in diameter, around which the surface has been bevelled to fit accurately the patient's sacrum and hips.

The table being first covered with sheets or blankets, or, if necessary, a rubber cloth, the patient is laid upon it with the head upon the lower end of the table. In this position the spine partakes of the curvature of the table top, the pelvis and hips being elevated.

If desired, a small pillow can be laid under the head so as not to elevate the shoulders unduly. The patient is now in position for the operation in umbilical, inguinal, and femoral Hernia; a position clearly the most favourable for the entire relaxation of the spinal, abdominal, and limb muscles. The Herniæ may now be returned within the abdominal cavity, where they will remain on account of the position of the patient, and can be at once operated upon.

This table can also be used in the treatment of uterine diseases and for operations on the anus, by placing a staff at the foot of the highest end of the inclined top on which to suspend a fountain syringe, bucket, or other vessel. The patient will be found to lie on this table in the very best possible position for the treatment of such cases on account of the concavity of the table from head to foot, and the circular orifice will allow all overflow to escape, thus keeping the patient clean and dry.

I now prefer and use the Goodwin invalid bedstead in my operations in place of this table, as I find it better adapted and much more convenient while operating, and the patient is not obliged to be moved afterwards till able to be up again, and

the desired elevation can be obtained, as the foot and head can be lowered or raised to any height and firmly remain so long as we wish by the means of a canvas bottom that is pierced with a hole, so that the bed-pan can be used without any trouble for all the calls of nature.

OPERATION FOR INGUINAL HERNIA.

The patient is first placed upon this table, or, if the table be not at hand, upon a bed, in which case the hips should be elevated by a pillow, whilst the head and shoulders should be allowed to fall somewhat lower in order to produce a slight curvature of the spine and a relaxation of the abdominal muscles.

If a bed is used, the legs of the patient should now be drawn up, but if the table is used, this same position is gained by the foot rest below the surface of the table.

The patient being thus in a relaxed yet firm position, we seek the Hernia to be operated upon, and, after reducing the protruded intestinal sac and omentum by taxis, we pass the left middle finger up the spermatic canal until we come to the inguinal ring. The end of this middle finger, being slightly raised as above mentioned, is felt by the forefinger, which also helps us to indicate the exact point, and is a guide to insert the point of the instrument. Having ascertained that the ring is well open and free from attachments or adhesions to the returned sac, we begin to insert the needle at the lower portion of the ring, where we feel its edges through the abdominal parietes.¹

The needle should always enter this lower portion of the ring, as in passing obliquely upwards and backwards it is less likely to wound either column of the internal ring. Great care should

¹ All the sac that can be put back free from adhesions must be returned. If it is firmly bound down the injecting fluids should be freely distributed around it as thoroughly as possible.

be taken in inserting it through the integuments and superficial fascia, so as not to wound the external pillar, but to enter the

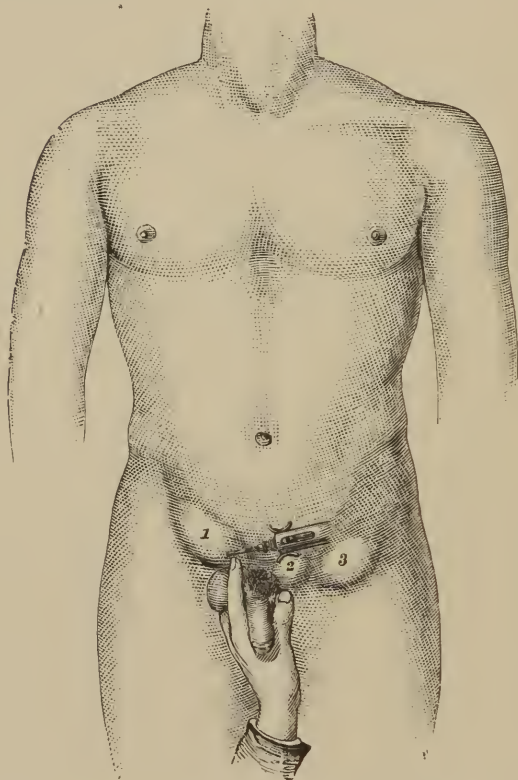


FIG. 36.—The three most common forms of Hernia, in the order of their occurrence in the male, are (1) Oblique Inguinal ; (2) Direct Inguinal ; (3) Femoral.¹

canal at once. The needle then should never be passed in a perpendicular direction, as there is thus danger of wound-

¹ The artist has drawn the instrument too nearly horizontal, so that it appears as if it were entering the right *groin*. The instrument should lie across the thumb of the left hand between the first and second joints, making an angle of about forty degrees when the needle first enters. After passing the superficial integuments the instrument should be depressed so that the needle may pass freely into the rings along the superior surface of the spermatic cord, taking care not to wound the cord.

ing the spermatic cord, but it should receive the necessary obliquity as soon as we feel that it has passed through the integuments. We can diagnose the position of the needle when first entering, by passing the left fore or little finger up with the invaginated scrotum upon it. When we have passed the needle through the integuments, we begin to open the valve and slowly push the needle in the direction already indicated. As the needle is thus inserted, it revolves and injects the fluid in sufficient quantities to cover well the external and internal rings.¹ The needle is now slowly withdrawn, still injecting fluid in its backward motion. As soon as the needle is withdrawn, pressure is made with the end of the fingers over the wound and rings for five or ten minutes, until the smarting and throbbing pain subsides.

Now a pad about three by four inches and three-quarters in thickness is made by folding a linen napkin once or more. This pad should be immersed in cold water and applied, gentle pressure being at the same time constantly exerted until the bandage, which should be double and three or four inches wide, is passed round the body and firmly secured by pinning. In double Hernia this bandage should be kept from slipping upward by two perineal bands beginning at the crests of the ileum and pinned near the symphysis pubis in front.²⁰

The patient is now placed in bed with his legs side by side and should remain upon his back in this position for from twenty-four to forty-eight hours. He should not be allowed to rise in voiding urine or attending to other calls of nature but the bed-pan should be used for such natural calls.

¹ In most cases ten to twenty-five drops will be sufficient. It will be remembered by those present at my operation, August 19th, 1880, at Guy's Hospital, where the ring was very large, as demonstrated by Mr. Bryant and Mr. Smith of the Seamen's Hospital, that I was obliged to use thirty drops.

OPERATION FOR FEMORAL HERNIA.

Same position of the patient as above. Having ascertained by diagnosis whether the Hernia be femoral or inguinal, that is, having found the relation the Hernia bears to Poupart's ligament (femoral Herniæ lying below this ligament and inguinal Herniæ above), and having selected the position of the saphenous opening to which we are easily guided, if the femoral Hernia has emerged from the femoral canal, the operation is performed in a manner similar to that in inguinal Hernia.

This saphenous opening we can usually locate by pressure in the thigh below Poupart's ligament and about three-quarters of



FIG. 37.—Femoral Hernia as usually seen in female.

an inch to the inner side of the femoral artery. Over it usually lies a lymphatic gland, which is much enlarged if a truss has been worn.

In most cases the sharp edges of the falciform process or fascia lata may be found thickened and hypertrophied from friction. This results from the action of the truss upon the Hernia, and forms our landmark, for its curve is peculiar and not readily mistakable in making our definition. For similar operation see *Heaton on Rupture*.

The Hernia having now been reduced and the forefinger pressed against the outer edge of the falciform process, the

needle of the instrument is inserted into the canal just above the saphenous vein and on the inner side of the femoral vein which is held to one side by the finger, care being taken not to forget the femoral vein that often lies posterior to the hernial membrane. The needle thus enters the femoral canal external to the hernial membrane.

The irritation applied to the crural ring should be slight, as femoral Hernia will not require so much of an irritant as an inguinal one of nearly the same size. The pad and bandage are applied similarly to those in inguinal Hernia, only run the Spica bandage as seen in Fig. 33.



FIG. 33.—Spica Bandage.

Of all Herniæ, femoral are the most difficult to cure by this operation, especially in females, as they require the utmost skill and care on the part of the operator, because of the extreme length of the ligaments which make up the crural ring, and because of the immediate relation of the femoral veins and arteries, and because in large and long standing Herniæ the sac is often ramified by branches of large veins and arteries, together with lymphatics.

OPERATION FOR UMBILICAL HERNIA.

From the ease of diagnosis this will not require any lengthy description. The patient is placed upon his back as in femoral Hernia, except that the feet may be slightly elevated. The finest needle which revolves once in going one-half of an inch, is selected and passed to the centre. As soon as it has penetrated the integuments, we deliver the injection with some force upon the edges of the ring by throwing the valve wide open.

Care should be taken in this operation not to puncture the peritoneum. Where the integuments are very thin and the Hernia small, as in children, the hernial rings should be seized with a pair of dressing forceps and elevated while the needle is passing through them. In extreme and old Herniæ of this kind, two or even three points may be selected for injecting the irritant. This is necessary in cases of extreme size, in order that the liquid may bathe the edges of this enlarged umbilical ring. The bandage and pressure is the same as in the other cases mentioned.

In addition to these usual injections into the hernial rings, I have found when the opening in the rings has been very large, the following plan of reinforcing the ordinary effects of our operation to be of great value. While withdrawing my needle after the primary injection, I allow sufficient fluid to escape into the superficial parts to create a more or less permanent swelling over the rings. This has a tendency to form a large tumefaction over the seat of operation, and acts not only as an additional support, but also as a compress just where we most need and desire pressure. This contracted thickening of the tissues will remain in this state for months, and adds much to the success of the operation.

One might think at first, from this swelling, that we were dealing with an abscess produced by our injection, but this is

not so. On the other hand, we often do get small superficial abscesses similar to those following the hypodermic injection of morphine or ergot ; but these are of short duration, seldom larger than a pea, and after ten to fifteen days may be pricked. They will exude their contents—usually a mixture of bloody serum mingled with our injecting fluid—and in a short time will readily heal.

This modification of our usual operation is especially effective when the patient is very spare and thin over and in the vicinity of the hernial protrusion, when we are dealing with either inguinal or femoral *Herniæ*. From this it will be evident that in all cases of umbilical *Herniæ* it will always be best to inject the superficial tissues, because the integumentary coverings are so thin and require so much the more the additional cicatricial thickening.

If upon the day following the operation of injection we find there has not resulted a sufficient flow of lymph, we can readily excite a greater flow by pressing the ends of the fingers into the external ring, pushing all the external integuments down upon the internal ring, and when our fingers are in this position, by rubbing and twisting the integuments between them with more or less force. This rubbing should never be repeated after the first day succeeding the operation ; and in consequence of its necessity, we should warn our patient that he must remain at rest a day or two longer than if the rubbing had not been made.

Heaton, to supplement his injection, was in the habit of serrating the columns of the internal ring with the point of his needle. We should, however, remember that if this manœuvre be carried to too great an extent, the result might be that inflammation would set in rather than the effusion of lymph, that we might seriously injure the peritoneum, or that we might cut some important vessel from which a severe, if not fatal hæmorrhage might take place. It is not a procedure that I

should recommend any one to adopt, as with my more stimulating injecting fluid, and the after operation of rubbing, I can with more safety and surety obtain far better results.

At the risk of repetition I will, at this point, institute a comparison between the effects produced by the old fluid of Heaton and the new mixture of my own. The application of a mustard paste to the surface of the skin will excite a great amount of irritation, and what might have been called, by older writers, a dry and local inflammation. If in place of the mustard we apply a blistering plaster of cantharides, we shall get a greater amount of lymph effusion with far less soreness, tenderness, and inflammation of the surrounding tissues. From this I intend the inference to be drawn that mere soreness and tenderness of the rings is no criterion that the operation of injecting the hernial rings has been successful in occluding the hernial opening. On the other hand, the success of the operation depends entirely upon the effusion of lymph sufficient to produce new tissue in the rings. Of the amount of this effusion we can judge by the soft and fluctuating appearance of the swelling over the seat of our operation, feeling like fluid beneath the folds of a thick rubber bag.

AFTER TREATMENT.

From six to eight hours after the injection, an increase of temperature, a slight increase of pulse and a feverish condition showing a slight constitutional disturbance will set in and continue usually from three to four days, when it will be found gradually to subside. The patient should have a light liquid diet, and, unless otherwise indicated, should have cold water constantly applied by means of a compress, from beginning to end. Morphine or some other anodyne can be administered to secure quiet. The bowels should not be moved, if possible, until the sixth or seventh day, and then by some gentle cath-

artic. Fluid as drink can be had *ad libitum* in the way of cold water, but no stimulants of any kind except under the utmost urgency, and on no account is tobacco to be used.

This treatment should be continued for at least a week or ten days, the patient lying in bed and as much as possible upon his back. The first four days he should remain constantly upon the back, as any other position might injure the process of adhesion of the rings caused by the irritant.

This is an operation which, if it should not be successful, has put the patient to but little pain, inconvenience, or danger; and should we not fully succeed, we have not left our patient worse than we found him, as there is always a partial if not a full occlusion of the rings; — so if we do not fully close them, we have somewhat benefited the patient. This cannot be said of many other operations performed for the relief of Hernia.

It now, perhaps, would not be out of place to consider the various kinds of Hernia which would promise the most favourable results from this operation in our next chapter. See Sec. II.

In performing this operation it is not desirable to use ether, as it is apt to excite vomiting, and I only resort to it with the very timid and sensitive. It will be found more necessary to etherise in children and women than in men, to overcome their fear rather than from any pain they would experience in the operation.

Chloral hydrate may be given a few hours before the operation with almost as good results as those obtained from ether, producing sleep and freedom from pain and fear.

Great care also should be taken not to allow the patient to stand upon his feet too soon, as from past experience I am convinced that very few cases which have needed a second operation after they have in the opinion of the physician and the patient himself, completely healed, would have required a repetition of the injection, had they been more prudent and

been content to remain quiet a little longer. Do not be too anxious then to see the results of the operation, but let nature take her time in occluding the rings.

Moreover, when we allow the patient to stand upon his feet for the first time, we should support the injected parts with the tips of the fingers and on no condition remove this support while he is standing. He should not be allowed to cough, bear down or make any undue exertions for two or three months, at least.

A bandage or truss should now be worn for from three months to a year or even longer if the patient follows any occupation where great violence or powerful exertion is liable to occur. After this if the rings remain occluded and firm he may dispense with the truss or bandage.

ON OBSERVING CASES.

From a careful watch kept over the after history of cases we have operated upon, we shall probably from every case learn something new and valuable to us which will be of perhaps incalculable benefit to us in some future operation. I have yet to see two *Herniæ* precisely alike in every particular. Although the kinds of *Herniæ* usually met are few, the variations upon these few kinds are indefinite in number and appearance.

Examine each case carefully, study it in its minutest detail, mark well all the surrounding and attending circumstances, whether the *Herniæ* be large or small, painful or not, congenital or accidental, age of patient at the time the *Herniæ* first appeared and at the time of operation, history of the *Hernia*, habits and occupation of the patient and whether there is any hereditary disposition to *Hernia* in the family.

Carefully noting all these points, we are enabled to treat the patient and the *Hernia* more intelligently and carefully than if we knew nothing more than the mere fact that a *Hernia* exists upon which we are requested to operate.

CHAPTER VII.

GENERAL REMARKS.—I. SELECTION OF PATIENTS. II. KINDS OF
HERNIA BEST TREATED. III. PERCENTAGE OF CURES. IV.
CAUSES OF FAILURE. V. RECORD OF INTERESTING CASES.

I.—SELECTION OF PATIENTS.

A CAREFUL discrimination between the different conditions of the Herniæ and of the patients to be operated upon should always be most scrupulously made if we would have success attend our efforts for relief and cure. The operation I present is no more adapted indiscriminately to all suffering from Hernia than is any other surgical operation for the relief of any other bodily affliction. No surgeon in capital operations would think of disregarding the physical condition and attendant circumstances of a patient submitting himself for treatment. Why should this disregard be so common in the treatment of Hernia? I am convinced that the vast majority of Hernia cases are treated in just this careless way, and that in this method of treatment lies the secret of the poor success of many of the operations.

This subject has never to my knowledge been stated, discussed or emphasised in any essay or work on Hernia, and I am more and more surprised every day to think that such an important and indispensable element of the operation should be allowed to pass unnoticed by the many writers upon the subject.

Although Dr. Heaton said nothing of this in his work, I am convinced from my personal friendship and intimacy with him that he always made a careful selection of his cases, and that in this was one secret of his success. When speaking of his invariable success he was in the habit of giving me a peculiar wise and knowing look of the eye, and he would say that he cured all, or about all, that he *would* operate on. At that time I did not attach much importance to this expression, but now that I have been operating myself I think I see the meaning. The selection of his cases was the great and only secret that he withheld from the profession. He often ridiculed the idea of the indiscriminate application of the method of injection to any and all cases of rupture, saying that the general health of the patient had much to do with the success of the operation.

I am sorry that in his work on rupture he still preferred to keep this important portion of his secret to himself. From what I have already said I think the reader can safely judge that I am perfectly free and open in the whole operation, and that I am desirous that the operation shall stand and be criticised only upon its *true* and tried merits. I would under no consideration lead a single operator astray in the operation whether by being too self-confident or by unfairly and with prejudice and concealment stating my candid views upon the subject. What I seek is that mystery may be removed from the operation.

When this operation is attempted upon persons in poor and indifferent health or of great delicacy, enfeebled by age or a broken constitution, upon those who have lived lives of intemperance and debauchery or who are suffering from syphilis or scrofulous affections, upon those living in crowded and unhealthy places as in the filth and poverty of a great city, upon those in hospitals, or public institutions as almshouses, jails, places of detention, or prisons, or upon poorly nourished

and anæmic persons and upon dispensary patients, the prognosis will be very unfavourable and the chances of success very small and uncertain.

On the other hand, we may expect to get the best and most successful results with the least trouble and vexation from the operation when it is performed upon persons in a high state of health, muscular strength and vigour, upon those who live in the country, or who are in the habit of being in the open air much of their time. I find persons who are in the following out-of-door occupations to be the most favourable to receive the operation for Hernia, and I have endeavoured to arrange the list in a careful order placing the occupations that promise the greatest health in their successive order: Farmers, country gentlemen and their domestics, teamsters, lumbermen, sportsmen, soldiers, sailors and marines, masons, carpenters, civil engineers, men employed on railways, and professional men.

II.—KINDS OF HERNIA BEST TREATED.

Having now spoken of those upon whom this operation is likely to succeed, it here, perhaps, would not be out of place to consider the various kinds of Hernia which would promise the most favourable results from this operation.

In accidental or congenital Hernia in persons between the ages of four and twenty years, the most favourable results may be expected. Unless the Hernia be large and of long standing, the injection need not be very stimulating. The youngest child I have operated upon was four years of age. This was a very delicate operation for a large umbilical Hernia, which was not easily controlled by mechanical means, owing to its size and extensive protrusion. The operation resulted in a cure. I would not advise the operation for femoral or inguinal Hernia unless the patient was at least five or six years of age, preferably ten or twelve. In the cases of these little patients a

properly fitting truss, which may itself effect cure, should usually be tried first, unless the child be very nervous or the parts so irritable as to render the truss or other support intolerable.

After the age of twenty-one the cure is more difficult. Satisfactory results are only to be obtained by the use of a more stimulating injection. More than one injection is often required. The older the patient and the larger the Hernia, the greater the difficulties become, though enormously large Herniæ, such as, to all appearance, would preclude reasonable hope of cure in accordance with our previous ideas, may now be relieved or cured. Almost certainly if we do not succeed in closing the hernial rings, we may cause a certain amount of contraction and a corresponding degree of relief, if not a cure; at least the patient will be benefited rather than injured by the operation. Some patients even say that they would gladly submit to the operation once in a few months rather than suffer the hernial protrusion. The opinion of certain critics that the operation, if unsuccessful, would do harm by leaving the edges of the rings fringed and jagged and sensitive, may be safely left to the honest opinions of such gentlemen as may give the matter their careful consideration. The absence of cutting and irritation of the surrounding parts with the knife, or sharp instrument, is opposed to this criticism. The parts, after the operation, naturally become infiltrated, from the internal to the external rings, with plastic lymph. Should this give way, which may possibly occur, the previously agglutinated parts, we may presume, would remain as smooth and free as before the operation.

I have never seen a case once fully cured by this operation in which the relief has not been permanent. Even partial contraction of the rings certainly favours more or less retention of the Hernia within the abdominal cavity. I have never

observed a case in which reabsorption of the effused lymph had taken place, although subsequent rupture of the new plastic formation may occur. But in my experience, at least, it has not occurred to its former extent. I now refer to cases operated upon by Dr. Heaton, in which his plan, his instrument, and his mixture were employed. In these cases I believe the cure would have been perfect had the treatment been repeated once or twice.

In my personal experience I have yet to see a case of relapse, after a cure has been perfected, nor do I believe such a case will occur except in extreme old and congenital Hernia, or as the result of undue straining due to convulsions, or to some other cause. Inguinal Hernia, direct or oblique, is most easily treated by this operation, and a favourable result is most nearly certain. Umbilical Hernia, in respect of results, stands next to the inguinal. The most uncertain variety, and the most dangerous to treat, is the femoral, which will be found to require much less fluid in proportion to its size than any other variety. I have expressed the opinion that ten drops injected into the femoral, are equal in irritative power to twenty drops in inguinal or umbilical Hernia. Old ruptures with thickened sac and adhesions are more difficult to manage, owing to their attachments. In such cases, after reducing as much as possible, do not inject the sac all around, but throw the greater portion of the fluid upon the superior part of the adhering sac, so as to get abundant effusion to form attachments on the upper surface of the protruding sac. By this means we shall more probably secure both occlusion and contraction of the rings. This is because the superior parts of the hernial rings generally give way first, on account of contraction of the abdominal muscles. In such cases more or less bulging of the parts after the operation will generally be present, an appearance which may wrongly be considered by the inexperienced an

evidence of failure. Close examination, however, will show that the protruding intestines are held securely in place. This bulging may be expected in all cases of old or long-standing rupture, because the muscles and integuments which have been so long distended by the protruding Hernia, naturally remain pendent.

I desire to lay additional stress upon the fact that this latter class of Herniæ should receive the most stimulating fluid to produce an effusion that would be at all effective in forming adequate adhesions. Repeated injection will also be required more frequently. The cases most difficult to effect a cure upon are those of old congenital Herniæ in patients over forty. In these cases the pressure of the abdominal viscera has been so strong at the superior portion of the internal and external rings that the two rings have practically been fused, so to speak, into one, and the surrounding muscular fibres have been changed into an unyielding condensed tissue. Upon this structure no fluid injection whatever is to be relied upon as capable of producing much exudation of plasma. The adhesions, therefore, would be very delicate, and it is questionable whether such adhesions and contractions would form in these cases, even though the patient were kept quiet for a considerable time. I am now engaged in the study of these doubtful cases, and have devised a procedure which seems to have promise of success. Should it succeed, I shall present it to the profession at a future time.¹

When the Hernia is in a state of inflammation from whatever cause, whether from the galling of a truss, or from an irritation produced by the reduction of a strangulation, or by the more or less forcible attempts to reduce an irreducible Hernia by dilating the rings after the manner of M. Vidal, no operative procedure by injection should be attempted. We should wait until the inflammation has subsided.

If the rupture is of long standing, is very large, and

¹ See p. 383.

accompanied with a greatly thickened sac of omentum, it would not be advisable to return the omentum with the intestines, particularly if it has formed adhesions and attachments around the rings and other parts. By attempting to return it we should almost inevitably stretch and enlarge the hernial rings that are about to endeavour to contract by our injection. Therefore it would be far better to excise the protruded portion of it, and to apply a carbolised ligature just above the point of excision. A dull knife, or the herniotomy saw of my device (see Fig. 56, page 239, for description and cut) will be found of very great advantage in dividing this omentum. After it has been sufficiently reduced in size to be returned into the abdominal cavity with the intestines, we may paint the parts with the fluid described under the treatment of strangulated Hernia, and proceed to dress and bandage as I have directed in reducible Hernia (see p. 169 and Fig. 38). See also p. 167.

In brief and to recapitulate :

Congenital Herniæ of all kinds in children from five to twenty years of age are very favourable, and almost effectually cured by this operation. No child under four years of age should undergo this operation except in extreme cases.

Herniæ, caused by accidents, when of short duration, even when quite large, are very effectually and generally cured by this operation.

Herniæ that have been caused by over-exertion such as convulsions, child-bearing, and the like, and which have existed over twenty years, can also be generally cured, requiring, however, more than one injection usually. The longer their duration and extent the more liable are we to be obliged to perform repeated injections in order to fully close the ring.

Congenital Herniæ of large size and long standing are difficult to successfully relieve and cure, unless we make several injections, although I operated last summer (1879) on a double

congenital Hernia (inguinal), one ring being two inches in diameter and the other one and a half inches. The one was fully closed with the primary operation, and the larger opening was closed by two injections. At the time of operating, the patient told me his Hernia had existed for eighteen years, but after he was cured he informed me that his mother said that he was born ruptured, he being at this time upwards of forty years old.

I speak of this case here to show what this operation is capable of doing. This patient was formerly not able to retain the Hernia on one side, it being so large, and the rings were so thin and the integuments so dilated that it would bulge out over the support which he was obliged to wear constantly. Yet the bowels of this patient are, to-day, retained within the abdomen, and he is very comfortable, although as a precautionary measure he is to wear for a year or more, as may be necessary, a very delicate and soft French spring truss of Tiemann's importation or manufacture. From such results as these I have astonished myself, perhaps, more than anyone else, as previous to my experiments and trials of the operation I could not believe that it was possible to produce such favourable results.

III.—PERCENTAGE OF CURES.¹

It will be seen from what I have said that Dr. Heaton professed hardly ever to have had a failure. Although he was remarkably successful yet I know he did have failures, especially in the last year of his life, because I have already met such cases, have operated on some of them, and shall operate on others in the near future. Dr. Janney, of Philadelphia, who next to me has now operated on the greatest number of patients by this subcutaneous method, thinks that he may fairly and without exaggeration claim 75 per cent. of cures. How many out of any given number of persons can receive a permanent

¹ See pp. 384 and 391.

cure by the method of operation as I do it, I am not at present able to say with exactness. I can however make an estimate based upon the cases I have thus far treated, and should judge that fully 80—85 per cent. of all I have operated on have been successfully cured. I base this high estimation upon the more stimulating fluid that I use, and the method of using it, as well as in the careful after-treatment. If such success shall continue to attend my efforts, and the efforts of those who may take up the operation, I shall certainly think that I have not in vain called the attention of the profession to the value of the cure by subcutaneous injection. Time and trial is the only means of settling this matter satisfactorily and conclusively. In all cases remember never to *warrant* a cure. Such confidence is beyond the bounds of all professional propriety.

IV.—CAUSES OF FAILURE.

Many who undertake to perform this operation will perhaps meet with failures upon their first attempts, and thus be ready to condemn the operation as useless, and think it overrated by the author and by those who may have been equally successful. They will imagine that we are too sanguine in our expectations, and referring to all the operations hitherto attempted from Celsus to Wood will class them and this in the same category as dangerous, seriously liable to failure, and outside the doors of legitimate surgery. They will not stop to consider that their ill success may be from fault of the operator, and not of the operation, but will jump at once to their hasty conclusion.

I have already spoken of the cause of failure as a result of performing the operation upon subjects not fitted to receive the full benefits of the injection. To show how little the operators upon Hernia have considered this matter I will mention the following instance.

While I was recently present at St. Albans, Vermont, to read a paper before the Vermont State Medical Society, a Professor in the Vermont University of Medicine, and also in one of the New York Schools of Medicine, told me that he should operate on every one that would let him. He said he had already operated once on a child without good results, and wished to know why I would not operate upon a child that was among other patients there presented to me to illustrate my method of cure. I told him the case was a very improper one. The child was only about three years of age, and the Hernia being an oblique inguinal, the spermatic and inguinal canal was not large enough to admit the middle finger freely into it. Besides all this, the child was nervous and uncontrollable, so that it would have been impossible to keep it still without opiates long enough to effect a consolidation of the lymph effused, even if we could have succeeded in producing such an effusion, which in a majority of these young cases is very doubtful.

Now this professor is one of the best surgeons in New York city, very highly esteemed by me, and has performed many fine and difficult surgical operations that are a credit to the profession he so ably adorns. This very fact that gentlemen of such distinction do not comprehend this operation, leads me more to the conclusion that the profession at large do not comprehend it, to say the least, any more fully.

Another cause of failure is that we may not have used a fluid for the injection that was sufficiently stimulating to agglutinate the parts around the rings, or if we use a proper fluid we may use too little to produce the desired effect. If on the contrary we use too much, we shall run into the danger of producing abscesses and suppuration, which is fatal to tissue formation from lymph. Sufficient compress may not have been made over the parts operated upon, the patient's bowels may

have been moved too soon, absolute rest may not have been enforced for the first four or five days succeeding the operation, so that the primary stage of tissue formation shall not be in the least disturbed, the patient may have been made to cough or perform some muscular exertion too soon after the operation, or, as I have before insisted, an improper instrument may have been employed. From all of these causes, it may happen that the injection will not be followed by success.

To illustrate how inconsiderate some may be in the after treatment, I mention the following incident selected from the many that could be cited. The gentleman under whose professional care I left the patient that I operated upon in St. Albans, June 15th, 1880, wrote me, July 3rd, as follows:—

“DEAR SIR,—The man J. B. on whom you operated is apparently well. I kept him on his back eight days; then put on the truss. There has been no appearance of the Hernia thus far. I had him cough the other day with bearing down without bringing down the gut.

“Yours truly,

“G. D.”

Such heedlessness is provoking, and contrary to all my advice. It is a wonder that such experimental coughing and bearing down does not often bring down the Hernia again in spite of all we have done for its retention.

One more cause of failure must be mentioned even at the risk of seeming to speak of a point so simple as to be almost self-evident. After all that has been said and written upon Hernia, many do not select, or seem to know, the precise locality or the proper part where to introduce the injection. Some have even thought that we could cure a Femoral Hernia by injecting above Poupart's ligament. The merest tyro knows better. Others have asked whether the injection is to be thrown into the *sac* or

into the spermatic cord. I am sorry to say that both these methods have been tried and success foolishly awaited.

V.—RECORD OF INTERESTING CASES.

In order to emphasise what can be done by this operation of injection, and to present a record of some very interesting cases, I insert, with a few changes to adapt it to book form, a paper read by me before the Otsego County Medical Society of New York, and before the Suffolk District Medical Society of Boston, Mass :—

When we consider the terrible distress this complaint of Hernia entails upon humanity, is it any wonder that a vast army of our fellow beings, rather than submit to the knife and the painful operations now performed for the cure of Hernia, seek relief at the hands of irregular and often itinerant practitioners, who by flaming advertisements and artful promises offer sure and painless cures, only to entrap, and so to say, devour their innocent victims, like the wolf in the fable? In view of such impostors and impositions, is it not high time that every son—I was about to add every daughter—of Esculapius should heartily aid every honest endeavour you or I or any member of the regular profession may make to develop, in an open and legitimate manner, an operation that has been many times performed with success? Nay, more, are we not in duty bound to the cause of science to endorse and encourage all such efforts, at least so far as they rest upon a true surgical principle and possess the merit of an honourable attempt to advance the medical and surgical art?

Many have been the attempts in the past to operate for the cure of Hernia by injection, and among the operators we find the noted names of Velpeau, Pancoast, J. Mason Warren, and others. While one discovered this important principle, and another that, none except Heaton ventured to inject hypoder-

mically without first cutting down upon the parts, and none were so successful as to warrant us in saying that they had really discovered a radical and lasting cure, except Dr. Heaton.

But because Dr. J. Mason Warren successfully injected sulphuric ether in one case (see *Observations on Surgery*, page 166), I am not bound to use only sulphuric ether in my injections; because Schwalbe, of Germany, injects alcohol, and Heaton oak bark, I am not bound to use either alone, if I can find a better formula. We all must reason for ourselves, and I feel confident that by combining ether, alcohol, oak bark, and morphia, in my injecting mixture, I occlude the rings with less disturbance of the constitution and of the heart's action, than where a single fluid is used alone. I wish to say just here, that at the time when I made up my formula I knew nothing of the use of sulphuric ether by Dr. Warren, or of alcohol by Dr. Schwalbe, in the cure of Hernia. (Although it is a strange coincidence, the idea was as truly original with me as it had been with them.) I recall one of my cases where the pulsation, which just before the time of operation was eighty per minute, fell after the operation about ten beats, and continued to fall, until in an hour it was sixty-five. While, then, this mixture exerts a sedative influence on the arterial system, its stimulating properties cause a rapid and localised effusion of lymph where it is desired for the organisation of new tissue.

In developing the operation, as I have said, I have not been necessarily the apostle or disciple of any one, nor have I felt myself bound by the teachings or examples of any one, except so far as I recognised that true principles and worthy precepts had been given. I present it to you simply on its merits, and ask only that you fairly investigate its principle and results before passing judgment on it.

I think I know somewhat of the conservativeness of the better part of our profession, and while I am, upon proper grounds, the

most conservative of conservatives, I do not believe it fair or just to be unreasonably prejudiced. Judging from the history of medicine and surgery, I feel very confident that when this operation is examined in its details and thoroughly understood, it will be accepted as one of the most legitimate operations for cure of Hernia. I do this operation as we perform all surgical operations, as an experiment (for we should always remember that every operation in surgery is on this principle).

I cannot with regard to truth and modesty, boldly assert such favourable terminations in *all* of my operations as we are led to infer by Dr. Heaton, in his work upon Hernia and in his reply to the committee sent him by the American Medical Association. Although he boasted so freely, yet you and the medical gentlemen in every city in the country *know* that he did not cure all upon whom he operated. There are some half dozen whom he attempted to cure, who are to present themselves to me for operation; one in particular, to whom Dr. Heaton said: "You see that sun shine? well, just as sure as that *sun shines* I *can* and *will cure* you."

I also find much in his book that is vague and unreliable, and might, if implicitly followed, lead one astray in the operation. I have the best of reasons for saying that had he lived he would, in a future edition, have corrected many statements, particularly in regard to the inflammation set up. This I know from going over the whole ground with him personally. Indeed, he greatly regretted that he had ever given the operation to the profession, from the fear that all would not fully comprehend his meaning, and that some one would use a dangerous-pointed instrument and bring discredit upon his pet operation, and, possibly, seriously injure or even kill a patient.

He would again and again refer to these hypodermic needles, spear- and lancet-shaped instruments, in terms far from commendatory, saying, "They will yet cut some artery so minute

that it will escape their notice at the time, the patient will bleed to death, and then they will condemn me and my operation."

I have thought that perhaps the best way for me to show you the merits of this operation for the cure of Hernia is to tell you of its success in my experience. I will therefore detail a few of my cases very carefully.¹

OPERATIONS NOS. 1, 2.—On July 10th, 1879, I operated upon Mr. G., aged twenty-three, for double inguinal Hernia direct, on both sides. The openings in the rings were one and a quarter inches and one inch, respectively. I injected about twenty minims into the larger rupture, which was on the right side, and fifteen minims into the smaller one, on the left side. After going through the ordinary course of a slight feverish condition, with an increase of temperature for three or four days, the case made the usual recovery, by perfect occlusion of the hernial rings and retention of the intestines within the abdominal cavity.

The patient appeared at the expiration of ten or twelve days as if he had never been ruptured, and no one would have known that he had ever been, unless by previous knowledge of the fact. The cure was simply perfect, without even the bulging of the integuments that we often see when by this operation a cure has been effected in large Herniæ.

The patient being a labourer, dusting and washing cars, I thought it best for him to remove the bandage which we had applied while he was undergoing the treatment, and wear a truss. I therefore ordered a double, hard rubber truss, thinking that this would give him the best security and freedom from accidents.

For this truss I sent him to an old friend of mine, a regularly educated and once practising physician, but now the head of one of our largest surgical instrument establishments in this country. With this patient I sent a note telling the doctor that I had just operated on the man for the cure of a double Hernia, and

¹ For fuller results, see p. 394.

requesting him to fit the case with a nice, suitable truss. After the patient had the truss put on by my friend, the doctor, he returned to me, and as it was not a suitable one I sent him back to the same place for a better one.

As I saw no more of him I supposed, from my long experience with the manufacturing establishment, that he had been properly fitted the second time. On the contrary, to my mortification and chagrin, I was soon told by the attending physician that this second truss was no better than the first, but that when the man sat down, it would strike against the back of the chair, and be thrown forward off the seat of the rupture, and thus would not support and sustain the weakened rings. Of course, our whole design in ordering it was to sustain these rings, as the adhesions had not yet become sufficiently strong fully to resist the pressure of the intestines and other parts against them.

His physician stated, also, that the patient said that the doctor, when he fitted him, made him strain, force down and cough all he could.¹ By such treatment there was naturally produced some protrusion of the parts, and I said that if he had not by this means re-ruptured the man I should think it almost a miracle. As, moreover, he assumed the liberty with this patient to tell him he was not cured, I took it rather ill at first.

Now I hear you say if this had been my patient I should have been indignant at such proceedings on the part of my friend the doctor, particularly after I had written to him that the operation had just been performed, and after I had in the most friendly manner possible requested him to fit the patient with great care. Please defer, for one moment, your harsh criticism, for in the first place the doctor did in this case just what most of us might

¹ This story should be taken with a grain of allowance, as my friend, who adjusted the truss, says he thinks the patient brought this condition of his rupture on himself, and I certainly would credit the doctor sooner than any patient.

have done under similar circumstances. The patient is said to be cured, and to all appearance is cured (I may add that I truly think that this man was cured, and that such was also the opinion and belief of his attending physician); now I say, this being the case, the doctor did not stop to consider, it may be, the young and tender state of the united tissues, any more than many others would. This is an operation all are not conversant with, and just how strong the parts are and how far they will bear straining, all are not supposed to know at present.

Suppose, too, on the other hand, we were a dealer, fitting, for example, a wooden leg, and wishing to sell, would it not be natural for us, regardless of the very recent cicatrix, to cause the patient to force his amputated limb into the artificial one, and to try and convince him that he could walk more miles without fatigue with this leg than with the one lost in battle?

No, gentlemen, I do not blame my friend for thus treating my patient, and it is with no ill feeling that I refer to the matter at this time, although it is true that this was my first operation for the radical cure of Hernia, and naturally a pet one. I speak of the case to show that it proves one thing certain, viz.: that a great amount of violent treatment can sometimes be endured immediately after the operation without a new rupture taking place; for with this man one side, strange to say, did not move or protrude in the least, while the other did.

Still, I would not advise much violence to be done to the tissues while they are in a fresh state of adhesion, since their condition soon after, nay, for months after the operation, may be compared to freshly-glued pieces of wood. It is true, there will immediately be some adhesion, so as to hold them together, but if any force, even of a very slight nature, be at once applied, it will cause them to part. Should, however, a longer time be allowed to elapse before force is applied, the pieces will be found adhering so firmly that the fibres themselves will

separate sooner than allow the wood to part. Just so is it with the tissues of the body after this operation. The tenor of adhesiveness of the rings and surrounding parts is at first slight, but after a period of time the new formation of adhesive fibres will often be found stronger in cohesion, because of their contraction and consolidation, than any other part of the dependent tissues composing the rings.

This case is instructive, then, in three ways : *First*, it shows how a severe Hernia may be successfully cured : *secondly*, how much ill treatment a Hernia thus cured may sometimes endure ; *thirdly*, how easily this relief may be forfeited by interference with the process of healing, whether in fitting a truss or by making the patients cough, force down or strain in any way, to gratify a mere idle curiosity.

OPERATIONS Nos, 3, 4, and 5.—This case is a unique one, and in many respects more instructive than any we may ever meet again. Mr. P., aged between forty-five and fifty, applied to the late Dr. Heaton for an operation, but for some reason was deferred. After Dr. Heaton's demise the gentleman presented himself to me for the operation, telling me that he had been ruptured for eighteen years and that Dr. Heaton had promised to operate on him. I examined him, and frankly told him that I did not have much faith that he could be cured by the operation, but that if he wanted me to try to effect relief I would do so, with the distinct understanding that I did not know what the result would be, and that I would not, on any account warrant the least relief or cure.

Accordingly, on the 25th of July, 1879, at 220 Harrison Avenue, formerly occupied by Dr. Heaton as his hospital, I operated on the man for two of the largest Herniæ I have ever seen. They were double inguinal, on the left side with a ring two inches in diameter, on the right side with a ring one and a half inches in diameter. He said it had been well nigh im-

possible to retain the bowels in their proper cavity by any or all artificial means, and so great had been his pain that he was constantly longing for the time to come when he could lie down, to ease his sufferings. At the time of operation he was wearing a very large elastic abdominal supporter and truss combined, although neither this nor the "hundred different trusses he had at home" could retain the ruptures in their proper position, because, as he expressed it, the *Herniæ* were so large, especially on the left side, that they would "boil over" any truss that was applied. It is needless to say that the patient was suffering not only this physical anguish, but also mental depression.

In my operation I found it necessary, on account of the greatly dilated rings, to inject a larger amount of *quercus alba* than usual. About eight hours after the injection the pulse and temperature began to rise, reaching their maximum on the second and third day. On these days the temperature was 99.5° and the pulse about 90. They now began to diminish until on the fifth day only a slight increase over the normal condition was noticeable. On the same day he had a free evacuation of the bowels, from a dose of Seidlitz powder.

During all the time since the operation the urine was passed normally, and he complained very little of pain, except in the immediate vicinity of the rings, where the injection had been made.

On the eighth day after the operation the swelling, which at its maximum had extended up as high as the crest of the ileum, running along the oblique muscles on both sides, had wholly disappeared. There was no tenderness around the umbilicus, nor any indication of inflammation of the peritoneum, except in a very limited spot around the rings. The hernial sac on both sides was enormously enlarged and thickened, and on the left side bound down by some adhesion. Upon examining the patient in the erect position, I found the *Herniæ* well retained in the

abdominal cavity and the rings firmly and well filled, except in a small portion of the superior part on the left side.

Fearing this might dilate, and finally allow a hernial protrusion, I operated again on August 2nd, on the left side, to guard against such an accident. This second injection produced phases similar to those in the first operation, with a little greater swelling, but on August 11th the swelling began to pass away, and everything to assume a normal condition. Now, standing my patient upon his feet, there was no protrusion on either side, and I thought of discharging him in a few days, cured of a most remarkable Hernia. I therefore allowed him to sit up, for an hour or two daily, but on the 13th I found that he had extended my hour of allowance to the liberty of sitting up from morning till night. Secondary swelling immediately began to appear, but from the applications of cold water and enforced recumbent position, they had diminished on the next day to about a normal state.

The man was continually anxious to return to his home, in Lawrence, but both I and the matron urged upon him the expediency of remaining at rest a few days longer. I told him that there was danger that the effort of the journey might produce an abscess, or even loss of life. In spite, however, of all our arguments and persuasions, go he would, and go he did, assuming to himself all responsibility and risk in such a reckless act. Accordingly, at noon on the fourteenth he left our care for his home. In consequence of this exertion there was, as we anticipated, a return of the swelling and the formation of an abscess. He was treated very successfully in his trouble by Dr. G. W. Garland, as the following letter will show:—

LAWRENCE, *Sept. 15th, 1879.*

“DR. J. H. WARREN—

“DEAR SIR,—Mr. P. came to Lawrence Thursday, August 14th. I saw him the following Friday. It was perfectly

apparent at that time that he was to have an abscess. It was opened August 20th, under ether and a disinfectant spray. An opening was made large enough to explore the bottom with the finger, which seemed firm. The abscess proper was quite as large as a common saucer, and swelling, tenderness and pain extended up the groin as far as the crest of the ilium ; another abscess formed in the scrotum, just above the testicles and over the cord, which was opened August the 30th ; still another was opened September 10th, just above the original one. The one on the scrotum has healed, the others are doing finely. A large portion of dead tissue came from the floor of the main abscess. The surrounding induration has been treated with tincture of iodine, and both hot and cold lotions, and is quite rapidly subsiding.

“ I have neglected to mention that after Sunday, the 17th, a severe fever followed a chill for a day or two. There is no protrusion of the *Herniæ*, and the case, for so bad a one, is doing well. Mr. P. is to go to Andover next Wednesday, P.M., a mile and a half from Lawrence. He is gaining strength fast.

“ Very truly yours,

“ G. W. GARLAND, M.D.”

On September 26th, Mr. P. called at my office, and I found that the principal abscess had been just above the seat of my operation, and was still slightly discharging, as was also the one in the upper part of the scrotum. There was considerable induration and a large cicatricial indentation of the parts around the lower portion of the ring, extending down to the spermatic cord. There was a slight protrusion of the upper portion of the omentum, but no sign that the intestines had descended through the ring. I ordered cold compresses, with proper supporting bandages, and enjoined absolute quiet, in bed. He now regrets

that he did not remain longer in Boston, instead of hurrying home.

On October 8th I again examined him, and found the swelling and congestion still existing, although greatly diminished. I found that instead of a good supporting bandage he had applied a very frail and wholly inadequate affair, and I now applied a delicate, French double truss, and ordered frequent bathing of the parts in cold water and carbolic acid. It will be remembered that he told me at the time of my first operation on him that he had been ruptured eighteen years. He now told me that his mother had informed him that he had been born ruptured, and that his father had taken him when a child to have a truss adjusted. I told him that had I known this before I operated I should on no account have taken the risk of operating on such an enormous congenital Hernia. My operation in this case had been performed with the simple extract of quercus alba and morphine that Dr. Heaton recommended, but with a needle of the Doctor's that I had improved by making two more orifices near the point.

Although performed with so unsatisfactory a needle and mixture, it establishes three very important points : first, it gives us the pathology of such cases soon after the operation ; second, it shows how very important it is, if we would escape dangerous consequences, to insist upon and enforce rest in the recumbent position, together with constant applications of cold water at the least appearance of a secondary swelling and inflammatory process ; third, it shows what a wonderful result can be obtained by the operation in cases hitherto deemed incurable, as *e.g.*, congenital and enormously large Herniæ.

January 29th, 1880. I examined this patient, and find he is perfectly cured on one side ; on the other side there is some omentum, protruding, which will require another injection, and with the mixture I am now using I hope to fully close up the

rings, as it is more stimulating than the mixture of Heaton that I used in my operation on him. He is very anxious to have me try again, which I promised to do as soon as I think proper.

OPERATIONS Nos. 6, 7.—Having found these cases so fruitful in instruction and encouragement, I undertook my sixth operation with increased confidence. Mr. M., aged sixty-two, had been ruptured when eleven years old. This rupture, oblique inguina on the left side, continued to enlarge until he was twenty-one or more.

For nine or ten years it gave so little trouble that he did not think it necessary to wear a truss. Ever after that time, however, he wore one, until July 30th, 1879, the day I operated on him. The hernia was an inch and a half in diameter, and protruded about the size of a duck's egg. I injected twenty minims of fluid extract of quercus alba with one tenth grain of morphia. He went through the customary phases—slight rise in temperature and pulse, then a gradual subsidence—until, after eight or ten days, he returned to his normal condition. On the 11th of August, only twelve days after the operation, he rode out, free from his rupture, without even the slightest bulging of the tissues so long dilated.

We have now come to the interesting and instructive part of the case. I have said that so far as I could ascertain by careful examination, in the erect and recumbent position, the ring was entirely occluded with firm surrounding parts.

The confidence both of myself and of the patient in the perfect results of the operation was so great that it is true we applied only a supporting bandage, and the man returned to his usual occupation. In this condition he remained for nearly two months, when, relaxing in his attention to the proper support, he suffered a slight protrusion of the ring and at the same time a descending of the sac.

To remedy this protrusion I re-injected him on October 6th, with my mixture of quercus alba, alcohol, morphia and sulphuric ether. This injection created a slight local disturbance, but no increase of pulse or temperature, and produced a further contraction of the ring. Although it was not so fully contracted as after the first operation, still it was sufficiently contracted to retain the hernia within the abdominal cavity. Unwilling longer to risk a bandage, I ordered a light and soft French spring truss, to wear six or eight months, which he continued to wear until December 9th, when he again presented himself to me, and this time with a strangulated Hernia on the right side. It was a most curious case.

I reduced this new rupture and fitted the man with a soft double French truss. Having much soreness on this right side, extending down to the spermatic cord, he was ordered to resume the recumbent position in bed.

In spite of various soothing applications the pain continued for several days, extending now to the testes and scrotum, producing intense neuralgia in the former, with irritation and swelling. This state of affairs lasted with more or less acuteness until December 23rd, when I applied a bandage with compress, and allowed him to go to his office. I applied the compress bandage instead of the truss, from fear that too severe a pressure on the springs of the truss might produce violent irritation of the still tender parts. During all this time since the operation for Hernia I made frequent examinations, and found that since the last injection the ring on the left side had continued constantly to contract, so that the man may now consider himself healed on that side, at least.

The lesson here to be learned is, *first*, that had he been more careful, after once firmly closing the ring, to support it properly for a little length of time, so that nature might complete the consolidation, we should never have needed to make a second

injection ; *secondly*, that the patient must be made to be careful of himself until nature has done her work, and that he must not unwarrantably presume upon his perfect recovery until several months have elapsed ; *thirdly*, that for a long period after the injection the fibres of the surrounding parts continue to contract and consolidate, so that cases where we at first may be inclined to think we have not yet obtained a full occlusion may ultimately, if properly attended and cared for, become perfectly healed. Finally, we can again see that the long duration of Hernia is no bar to a radical cure by injection. For this patient has been ruptured forty-two years.

The first of these operations I performed with the old original needle of Dr. Heaton ; the two latter with his needle as I had improved it by adding more orifices for the exit of the fluid. I have detailed them minutely and fully, that you may see what great obstacles lie in our path, and how the slightest inattention or carelessness, either on the part of the operator or the patient, may cause a deal of trouble, not to say danger. It cannot be too solemnly impressed upon the patient that the success of the after treatment, (and that means the success of the whole operation) depends as much upon him as upon the operator. If, then, we retain all the valuable instruction these unfavourable symptoms inculcate, we may with a little cheerful perseverance wonderfully triumph by our success.

I will now give a few of the cases that I have had since the time that I reduced the operation to a more scientific basis, as I believe, by perfecting both the instrument and the injecting fluid (see *New York Medical Record* of October 18th, 1879). It will be seen that with this new instrument and fluid I encounter less danger, cause less constitutional disturbance, less unnecessary irritation and more intense local action where it is needed, and there alone, than could ever be possible by the crude methods formerly used.

OPERATION No. 8.—F. M., aged twenty-eight, had for two or three years suffered intensely, and had consulted several physicians, some treating him for disease of the liver, others for disease of the kidneys and bladder. The true seat of distress was an inguinal Hernia upon the right side, which was very annoying and painful, since the Hernia was exceedingly sensitive and irritable.

I found the protrusion was slight, with a ring about one inch by half an inch in dimension, and operated on it for radical cure, on September 6th. The patient made a rapid and full recovery, and sixteen days after the operation accompanied me to New York. Among the physicians who there examined him was Dr. R. F. Weir, who was fully convinced that there was a complete occlusion of the hernial ring. The man was ordered to wear a bandage, and was then discharged from my care. I saw this patient on January 24th; he is still free from his rupture.

OPERATION No. 9.—L. B., aged four years, was, after etherisation, operated on, November 4th, for a congenital umbilical Hernia, about three-quarters of an inch in diameter, and in appearance and size not unlike a red acorn. I injected eight to ten drops of the mixture. Passing through the usual slight feverish excitation, she was discharged from my care after two weeks' time, fully cured.

OPERATION No. 10.—On December 18th I operated upon J. R., aged forty-one, for direct inguinal Hernia on the right side. The opening was in size one inch by three-quarters of an inch, and had existed for more than two years. I was assisted by Dr. Joseph Redfearn, Jun., of Ashland, whose patient the gentleman was. I injected about fifteen minims of the mixture. The only pain was a sharp smarting for about five minutes after the operation, and on January 1st Dr. Redfearn and myself examined him, and were satisfied that the man had

fully recovered, with a perfect occlusion of the ring, and was ready to be discharged. I had a note from him on January 13th, and he is well and free from all trouble from his Hernia.

OPERATION No. 11.—Mrs. M., aged fifty-six, had had a femoral Hernia on the right side for more than thirty years. The opening through the tissues was flat oval, about one inch and a quarter by three-quarters of an inch, with a protrusion the size of a large goose egg. On December 25th I operated upon her, injecting about ten drops. She had just recovered from typhoid pneumonia, and still had a slight cold, so that it was only at her urgent request that I operated when I did. The smarting pain from the injection was very severe for five or ten minutes. On the second morning after the operation her cold was much worse, attended with pleurisy on the left side and a heavy cough, and her food had caused her to vomit. For three or four days her temperature was 100 and her pulse about 95, but whether from the fever or the injection could not be determined. On January 6th I caused her to assume the erect position, and found the rings occluded and the intestines completely retained in their cavity. So firmly occluded are the rings that, as she is rather fleshy, a little dimple is seen over the seat of the operation.

January 15th. She is cured of rupture.

OPERATION No. 12.—Mrs. L., aged forty-five, of delicate constitution, had a very painful Hernia on the right side, which had been strangulated three times, twice with great danger to her life. The Hernia had existed for fifteen years, occurring from a strain in child-bearing. It was very painful, and protruded about the size of a common cowry. There were two openings through the crural ring, the larger, from which the protrusion took place, near the femoral vessels. This opening was about three-quarters of an inch in length and measured three-eighths of an inch in width.

I operated by injecting about ten drops of my usual mixture. She was in the evening but slightly feverish, with pulse about normal, 78. The next day the parts about the ring were tender, and covered with a profuse effusion of lymph. She suffered great pain through the back, right hip and limb, owing much, as she thought, to the constrained position of lying on her back, as she had often suffered equally severely for months at a time. A pill of ext. hyoseyami, lactucarium, and morphia was given her, to secure rest and ease from the pain. Third day—Her temperature and pulse are about the same as on yesterday. I afterwards found that the cause of her pain was her periodical turns appearing. Upon examination, January 12th, the rings were found perfectly occluded and she cured of her hernia.

July 10th. She is free and cured from her painful Hernia, and a happy woman.

In all these operations I find that in order to insure success I must produce a certain, though limited, amount of inflammation of the surrounding parts. You will see that I have aimed to produce this. Dr. Heaton considered the inflammation very dangerous, and said that in his operations it seldom occurred. He meant peritoneal inflammation. Dr. Davenport,¹ editor of Dr. H.'s work, as directed by Dr. H., worked up a sort of pathology, to the effect that only, "tendinous irritation," as they call it, was caused, and no inflammation. I find that Dr. Heaton was mistaken in his pathology, as it is impossible to contract and occlude the rings without an inflammation, to cause an effusion of plasto-lymph. I learned, too, from Dr. Heaton's old matron, a very intelligent woman in such matters, that Dr. H. always got more extensive inflammation, swelling, and often abscesses,

¹ No disrespect is here intended to so good a man as Dr. Davenport, but this is nevertheless a fact, as told me by his cousin, Dr. D., of Boston, who said he knew that Dr. Davenport had to work up a sort of pathology to meet the statements of Dr. H. in his operations.

when he was successful, than I ever get in my cases. This excessive inflammation was probably due to the crude injecting mixture and instrument which he used. Indeed, I am often led to wonder that he ever succeeded with his operations at all.

I have now gone over all the ground that Dr. Heaton passed over, and have performed upon all the various kinds of Hernia which he operated upon, and I feel confident that my results, to say the least, have been as successful as his, in the same given number of cases.

In fact, the question whether Dr. Heaton ever cured any one of rupture, has been asked by those whose opinion is entitled to much weight. I can answer in the affirmative, because I have examined a large number of those upon whom he has operated for Herniæ of from one to twenty years' standing.

That he failed in many cases is also true. But in all his failures we should find, if we traced the operation, that there was only a slight infusion and only the most limited amount of inflammation, or what in his work is styled tendinous irritation. It is a well-known fact, that if we would produce a blister with cantharides, for instance, we must, in order to get an effusion of plasto-lymph, destroy the cuticle and create a given amount of inflammation. The same holds good in this operation. The parts must receive a certain amount of irritation from some stimulating material, to excite the secretion of this lymph. The more plentiful the effusion the more sure we are of strong adhesions and attachments, which will organise into fibrous bands, not unlike the cicatrix of a severe scald or burn. This draws and binds together the hernial rings and surrounding parts, and when properly performed retains the hernial protrusion in its proper cavity, more firmly than ever before, in many cases.

You will see that I have given you the history of twelve operations on genuine ruptures of various kinds. This does not include all that I have operated upon, but only a few interesting

cases. Of these twelve the first two were partial failures, and one later on. Two of these are soon to be re-operated upon, and I have no doubt that, with the mixture of such a stimulating nature as I now use, they will be permanently cured by the second injection. I have some doubts as to the possibility of retaining the large congenital Hernia, but as the patient is very anxious for another operation, I presume I shall try it. I have freely expressed all my doubts to him, but unless I operate upon him he will not be contented, nor shall we know whether such cases can be successfully treated. This includes all the unfavourable cases that I have had in my operations thus far. I might cite many other successful cases, but I have presented a sufficient number to give an idea of the results of the operation.

You will see, gentlemen, that I have felt it my duty to develop this operation with open hands, concealing nothing, but recording careful observations on all my cases, keeping nothing to myself in a selfish way, but offering everything in my power to the profession, in order to establish a legitimate operation. Others may have undertaken to relieve the ruptured sufferers by methods known only to themselves; I am determined to do what I can to demonstrate to myself, and I trust to you, that this operation, when properly performed, possesses many advantages over every other now known for the cure of this distressing malady. Whatever discouragements, whatever obstacles, whatever successes I have met, all have been freely given to the scientific advancement of surgical knowledge. To say that this operation for the radical cure is simple, and when carefully used by skilful operators presents no greater danger and no more unsuccessful results than other well-known surgical operations, is only the barest justice to its past and present success.

I am, therefore, encouraged to hope that other members of the profession will test it in the course of their practice, and

present us with reports upon the cases, that we may all, dispassionately and without prejudice, judge of its true value.

In reply to the gentleman who has performed Wood's operation successfully with wire, catgut, or pins, while these ligatures or the pressure of a truss may cause suppuration and an absorption or melting away, as he termed it, of the plasto-lymph effused, still I must maintain that the condition of the parts and the materials that I use produce very different effects, in the quantity of lymph effused, as well as in the permanency of the effusion. As this gentleman has never performed the operation for the cure by injection of the hernial rings, I cannot take his statements as of any authority in regard to the melting away of the lymph after my operation, whatever may have been the results, good or indifferent, after his operations by other methods.²⁸

Another gentleman's experience of twelve operations, with only one success, goes only to substantiate more fully what I discovered after my second operation, that a more stimulating mixture was required and a better instrument than the one recommended by Dr. Heaton. Another disadvantage he might have had is that his patients occurring in hospital practice were anæmic, not properly nourished, and therefore not in so favourable a condition as regards their systems as those in private practice.

Whenever Dr. Heaton's instrument and mixture are used the results will be very uncertain and unsatisfactory; although an abundant inflammation will be set up, the effusion of lymph will be proportionally small. In fact, the great cause of failure is not in all cases, as is commonly supposed, the lack of proper after-support, but that the lymph attachment is severed by muscular contractions, and the lymph readily absorbed.

I am not at all astonished at the questions asked as to my operation, when I talk with gentlemen at our medical meetings

and read the numerous letters of inquiry which I receive. For if one has not seen the operation and had it explained to him, he can have only the faintest conception of it, be he ever so good a surgeon or operator in general surgery.

Physicians and surgeons of no little renown have asked me if I pass the needle through the scrotum and follow up on the spermatic cord? Another asks if I go through the columns, and at precisely what point I cut through the rings? Some think there must be great danger in operating on Umbilical Hernia, since, as they say, we penetrate the peritoneum. In reality, the needle is **not** passed either into or on to the peritoneum.

Others think the inguinal region must be dangerous, because of the numerous vessels and nerves. The truth is that the umbilical region is the safest region to operate upon, inguinal less safe, and femoral the most dangerous. None should operate upon the latter, unless they are experienced.

Upon infants, as I have before said, I have never operated. The youngest patient was four years old. Mechanical appliances, such as a good truss or elastic bandage, I have found productive of good results.

I prefer a bullet, partially flattened and fastened to a linen bandage, because the compression of the abdominal muscles by the elastic bandage prevents their development, and consequently the closure of the rings, and also because the muscles are liable to be thinned by the constant pressure and for ever weakened.

In conclusion, I would say that above all the congratulations from gentlemen of note in the profession, the resolutions and the honorary membership of the Medical Society of Otsego County, New York, I esteem the commendation of my friend, Dr. B. Codman, who has, as is well known throughout this country, for many years attended to the mechanical treatment

of Hernia. He says, "I believe you have at last perfected this operation, and I know that with your instrument and fluid you will be successful in the treatment of Hernia by injection, and will have greater success than has been hitherto met with by any one ; with the adjustment of a proper temporary truss after the operation, a permanent closure of the rings will crown your efforts, and you will receive your reward from an appreciative profession."

CHAPTER VIII.

TREATMENT OF STRANGULATED HERNIA.—TAXIS.

THE treatment of Strangulated Hernia is one of the most important of surgical operations. We have not only to effect a reduction of the strangulated intestine and to remove the constriction, but also to treat the peritonitis. We accomplish the reduction by the operation of *taxis*, by which we mean all the manual methods used for the purpose of returning the protruding intestine into the abdominal cavity. The peritonitis may be excited either by the compression caused by the strangulation or by the attempts and efforts at reduction. We may in some cases have to deal with a peritonitis, the result of strangulation, increased by a peritonitis, the result of taxis. The taxis, however, when properly done, is rarely, if ever fatal, if a judicious after treatment be adopted.

The following valuable hints from Birkitt, I trust I may be pardoned for extracting verbatim.

“The principal circumstances to which attention should be directed are as follows :

“1. The kind of variety or the Hernia regarded in its anatomical relations.

“2. The duration of its existence ; whether it be of old standing and slow formation, or of recent and sudden development.

"3. The constitutional condition of the patient at the immediate moment, as influenced by the present illness. The hour at which vomiting commenced; and the variations which have taken place in the composition of the fluids vomited, should be determined with exactitude.

"4. The state of the tumour. Its usual size when not causing illness; its bulk before vomiting commenced; the changes which have taken place in it during this stage; the pains to which it gives rise, if merely local or extending into the abdomen, with or without manipulation; the condition of its coverings; its probable contents, so far as may be conjectured by the evidence, assisted by touch and sight.

"5. The treatment already adopted by the patient, the friends, or other persons before the observation of the surgeon."

In employing the taxis it is necessary, *first*, to have the bladder evacuated either naturally or by the catheter, and also the rectum; *secondly*, to gain a relaxation of the abdominal muscles, and *thirdly*, it is always advisable to administer an anæsthetic and preferably sulphuric ether.

The position to gain the relaxation of the abdominal muscles is important. After placing the patient upon his back with a pillow under his buttocks to elevate the pelvis, and with his head and shoulders raised, the thighs should be flexed by bending them up at nearly right angles to the trunk, and slightly rotating them inward.

The surgeon, getting into the position which gives him the greatest control of the tumour and the freest action of his hands, should make gentle manipulation upon the tumour for from two to five minutes, when, if reduction be not effected, he should try the application of cold to the parts. This application can be made with powdered ice, and sometimes by pouring a small stream of ice water from a considerable height upon the tumour and surrounding parts. The tumour can now be gently

squeezed between the thumb and finger and drawn outward to relieve the gut of its cramped position before renewing our manipulations. Should this not succeed we may, after a few minutes of rest, pour sulphuric ether upon the parts and fan it to cause a rapid evaporation. This evaporation causing intense cold contracts the superficial integuments, the sac and the included intestines much more rapidly than it does the solid fibrous Poupart's ligament; hence if we immediately apply gentle taxis we may often succeed in reducing cases hitherto supposed to be irreducible without the use of the knife. Changing the position of the patient from side to side will often aid in reduction by the specific gravity of the parts tending to suck the intestines into their proper cavity. If this be not sufficient to accomplish our purpose, the injection of large amounts of hot water per rectum is useful by distending the intestines and dragging them into the abdomen.³¹

To obtain a proper relaxation of muscles it has been recommended to use blood-letting to the point of fainting, to inject an infusion of tobacco or to administer tartarised antimony, opium, cannabis indicus, hyocyamus, stramonium, or belladonna. But although these have all been tried with more or less success,

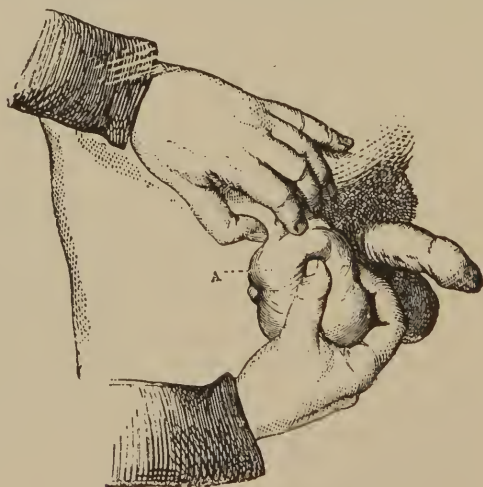


FIG. II. — Reduction of Scrotal Hernia by Taxis.

they are not measures which in these days of anæsthetic I would recommend, since by anæsthetic we gain a greater relaxation of the muscular system than is otherwise possible, and avoid the deteriorating and exhaustive influences of these drugs I have mentioned.

The taxis should be continued at intervals of a few minutes for from thirty minutes to three hours according to the alarming symptoms, the condition and vitality of the patient, and the length of time since the Hernia became strangulated. Of these the surgeon can judge when called to the case. In general we may say that we can treat old and large Herniæ, accompanied by omentum and occurring in persons of advanced years, with greater impunity by prolonged manipulation than small Herniæ with very acute symptoms. These symptoms will have shown themselves by violent retching, pain in the parts, and a feverish excitement of the system accompanied by giddiness or delirium. Femoral Herniæ are to be treated with the greatest gentleness, as with too violent pressure and manipulation there is great danger of rupturing and fatally injuring the intestines. Of all this let the younger men of the profession take good warning. In treating a strangulated Hernia let no undue violence be used. It can do no good and may result in extreme danger to the life of the patient from the forcible constriction of the inflamed intestine against the constricting ring. If the inflamed state has passed to gangrene we should never attempt the taxis for fear of fatal peritonitis. From the observation of many years I am convinced that the taxis is often too long continued before resorting to the operation of kelotomy, and I feel as confident that thousands of lives that are lost might have been saved by employing this operation in due season. The following quotation from *Surgical Anatomy*, by William Anderson, will illustrate my point. "I know of no excuse that would apologise for the delay which we generally witness before this

operation is resorted to, or which would authorise the surgeon who is to be the operator in allowing half a dozen consultants to take their turn in squeezing the tumour under the pretence of giving full trial to the taxis."

To illustrate a position for the patient, which in my opinion is very favourable for the operation of taxis, as well as to show the permanency of the ordinary operation by injection, I give the following rare form of femoral Hernia occurring in a patient of mine previously operated upon for inguinal Hernia upon the same side.

The history of this case is as follows : Mrs. M. L. L. of Athol, Mass., aged forty-five, was ruptured, at the time or soon after the birth of a child, some ten or twelve years ago. On right side the Hernia was oblique inguinal with protrusion of the size of an English walnut. It had been strangulated twice, both times with near loss of her life. It was reduced once by H. A. Dean, M.D., a cautious and skilful medical gentleman of fine scientific attainments in the profession, and the second time by Dr. Lynde in company with the above-named physician.

Dr. L. is also a physician and surgeon highly esteemed in the profession as an expert diagnostician. These gentlemen saw the patient soon after the Hernia became strangulated, and after etherisation succeeded with some difficulty in reducing the rupture by taxis.

This Hernia was very painful and difficult to retain with a truss. At the suggestion of her physician she applied to me for a cure by injection. Being on my vacation I did not see her until my return in the fall of 1879. It still gave her great pain and was very sore from the truss. I operated on her in the first part of January, 1880, with success, by injecting fifteen drops of fluid extract of quercus alba, alcohol, ether, and morphia. This Hernia was well retained and the rings occluded. In the early part of May, 1880, she had an attack of colic.

She felt something give way, and soon after had pains and symptoms of strangulated Hernia. Dr. Lynde being called tried to reduce the Hernia by taxis. After continuing his attempts for the greater part of a day, he thought that as I had once operated on her she had better again come under my care. As the seat of rupture and strangulation was not well defined, he in his diagnosis leaned to the opinion that it was an oblique inguinal, the same that had twice before been reduced and on which I had operated; but was not certain since my operation had left more or less cicatricial tissue, and had therefore a tendency to blind completely the seat of strangulation. This with the peculiar form of rupture was sufficient to lead the most experienced astray in his diagnosis.

The patient arrived in great pain in the night of April 29; with parts much inflamed and swollen. With the assistance of Dr. Broughton, I placed her under the influence of ether, and upon a most careful and thorough examination by both of us, we found the rupture was femoral, and about $2\frac{1}{2}$ inches from the oblique inguinal that I had succeeded in curing. It had descended on the outer side of the femoral vessels and beneath the femoral artery, the pulsations of which could be distinctly felt. The sac was preceded for a distance by the sheath of the pectineus muscle. After it had passed down beneath the femoral vessels it turned a short angle toward the left side, the largest part of the swelling being immediately beneath the seat of her former Hernia.

This diagnosis was sustained differentially by a most thorough examination, with some efforts to reduce it through the inguinal rings. Finding no opening, since the rings, as I have before said, were firmly occluded, I began to investigate and examine the crural ring, and soon discovered the seat of strangulation, as I have above stated, firmly held.

It should be borne in mind that the diagnosis was much more

than usually obscured by the parts being so inflamed and swollen. After placing the patient in every conceivable position, such as elevation of hips, curvature of spine, limbs flexed on abdomen, &c., and after working with great earnestness at reduction by taxis without gaining in the least on the strangulation, I thought of suspension. The patient being very slight, the limbs were seized under the knees by Dr. B., who stood over her, and I again worked with great ardour, but failed to gain any reduction of the strangulation. I was about to perform kelotomy on her, when, after further consideration of the anatomy, it occurred to me that if I forcibly flexed the thigh toward the left shoulder it would bring the obturator and other muscles, together with Poupart's and Gimbernat's ligaments, into a greater state of relaxation. On the first trial in this position of the parts, the Hernia was returned into the abdominal cavity, to the delightful sensation that rejoices the anxious heart of the operator.

On June 13, I was at Athol to operate upon this femoral Hernia. As the patient was not properly situated in her household affairs, the operation was deferred until the coming autumn. At that time I examined her in the presence of her attending physician, Dr. Lynde, and before Drs. Oliver and Parsons, of Athol, and Dr. Alcott, of an adjoining town, and demonstrated to their perfect satisfaction the seat of the oblique inguinal and of the late strangulated femoral Hernia. The latter was still somewhat tender from the strangulations as well as from our efforts at reduction several weeks before. This shows, also, better than anything I have yet seen, the permanency of my operation on reducible Herniæ by injection, for there must have been considerable force upon all the parts before she became ruptured in the femoral region. Still the injected rings of my first operation remained firm and strong, and to-day retain the rupture without any protrusion whatever.

This then is a very instructive case, first, in proving my

operation to be permanent, and secondly, in being a form of femoral Hernia seldom seen. Even the older writers have diagnosed or mentioned this form of Hernia very rarely, Velpeau and Cooper giving only two or three instances of this peculiar form. Thirdly, it will always serve as a guide to me in Hernia of this form, by teaching me to throw the leg of the patient toward the left shoulder, if the rupture be on the right side, and *vice versâ* if on the left side, and to flex the thigh forcibly on the abdomen. Since this will give us the greatest possible relaxation of the muscles and ligaments that hold the intestines in strangulation, and allow by this relaxed state an easy reduction.

If, for study, one will take the cadaver and experiment he will find this position the very best for reduction. I would state that this form of strangulated Hernia is rather difficult to handle by injections, owing to the close proximity of the vessels supplying these parts, sometimes further complicated by fine branches of the obturator and epigastric arteries which are thrown immediately over the point of rupture just beneath Poupart's ligament and at the angle formed by this and Gimbernat's ligament, at or near the junction of the pectineus and other muscles in this triangle. Greater care must be used in the operation for this form of Hernia than in any other, from the liability to penetrate these blood-vessels. Study well each individual case before proceeding to operate, or you will certainly do more mischief and harm than good to the patient submitted to the operation by injection for the cure of femoral Hernia by closing the crural ring.

Finally, after we have exhausted every effort of taxis by the various means above mentioned, before resorting to herniotomy we must consider whether it is not best to apply the aspirating needle (Fig. 40) to the distended sac and intestine, since by relieving the tumefaction of gas or other matter we can often

quite readily reduce the strangulated parts. For this purpose I use a needle of my own device, of a thin oval section, which will be found very advantageous since coaptation of the wound takes place much more readily than when the common needle, round in section, is used. This is apparent to any one conversant with the wounds made by a round or flat oval instrument,



FIG. 39.—Aspirating Needle.

When we are obliged to cut down upon the parts, to return strangulated Herniæ, it will often be found the best way to evacuate the gas and fluid which may be present in the sac before we divide Poupart's ligament, as by so doing we may be able to return the strangulated parts without carrying an incision so far into the parts, owing to the diminished volume of the tumefaction.



FIG. 40.—The first Aspirating Needle for tapping hernial sac in cases of Strangulated Hernia.

This fig. represents a trocar, invented by a farmer in Athol, Mass., to relieve himself of Strangulated Hernia while his physician was gone to get his instruments to perform herniotomy. The patient thought he would tap the tumefaction, and by so doing reduce the rupture, in which he fully succeeded. This is one of the earliest cases of the aspirating needle being applied to restore Strangulated Hernia. It was given to me by Dr. James Oliver, of Athol. He said the patient made use of it on himself twenty-eight years ago, as above described.

CHAPTER IX.

KELOTOMY OR HERNIOTOMY.

IF taxis does not succeed, and the more serious operations of kelotomy or herniotomy be decided to be employed,³² it is *ordinarily* performed in the following manner, although I have some suggestions and improvements that very much simplify the operation. Always supposing the patient to be under the influence of an anæsthetic, the patient is placed upon his back in much the same position as in taxis.

The bladder being evacuated, and the pubic parts shaved, the first step is to make an incision through the skin and superficial fascia over the prominence of the tumour, beginning at the superior extremity, and terminating near the base, and varying in length from an inch and a half to three inches, according to the size of the Hernia. This incision may be linear, crucial, Y-shaped, or of the shape of an inverted V, and is to be made through layer upon layer of coverings until the hernial sac is reached, the groove director being used to bring to view the deeper seated structures, and it being always a good rule to have a large external wound, but as small an internal one as possible. "In inguinal Herniæ this incision should be made along the line of the inguinal canal, from the internal to below the external ring; in femoral, over or on the inner side of the crural ring, either in a vertical or oblique direction, in the course

of Poupart's ligament, the former being preferable."¹ The sac will appear to our view of a bluish and vascular appearance in recent Herniæ; thick and opaque in older Herniæ. It should now be pinched between the thumb and finger, and the opposing surfaces rubbed against one another which could not be done were it anything beside the sac. The diagnosis can be confirmed by pricking the sac with a small needle. If this puncture be followed by a few drops of serous fluid our previous diagnosis will be confirmed. An opening is now made into the sac just

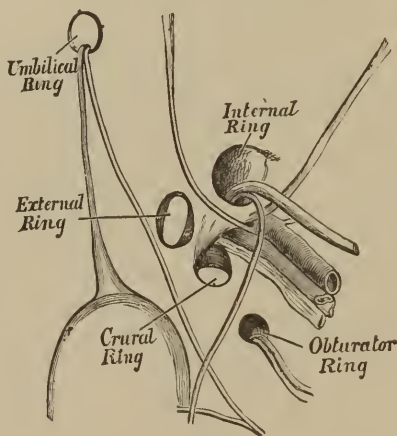


FIG. 41.

large enough to admit the point of the director, and the division carried upward and then downward, allowing at the same time the escape of the contents of the sac. In recent strangulations this fluid is small and sometimes absent; so that we should be guarded not to carry our dissection to too great an extent. The forefinger is now introduced as far as possible to search for the seat of obstruction at the superior part of the sac. The probe pointed bistoury is carried flatwise along beneath the stricture which is divided by bringing the edge of the knife against it.

¹ Bryant.

An absolute rule should be observed as to the direction in which this incision is to be made. We wish to avoid the epigastric artery. In an oblique inguinal, the artery is internal to the neck of the sac; in direct, it is external to the sac, but since old oblique Herniæ so often simulate direct Herniæ in appearance, the safest rule for cutting is to cut neither outward nor inward but directly upward.

Usually only a very slight incision will be necessary, perhaps only a line and a half in length.¹ After removing the dislocated viscera and sac from the seat of strangulation, we carefully replace all the abdominal parts that have escaped, that being reduced first which protruded last, and of course the bowel before the omentum. The wound is now drawn together by sutures, and the dressing completed by adhesive plaster, compress and a spica bandage.² The patient should now be made as comfortable as possible in bed, cold water slightly acidulated with carbolic acid being applied under the compress, and renewed from time to time. Morphine or opium should be administered, both to secure rest and also to secure the patient against that inflammation always to be dreaded—peritonitis. The spica bandage and compress should be continued until the patient can bear the pressure of a truss, when a properly adjusted one should be applied and worn.

A few of the many modifications of directors and herniotomes are here illustrated. Some are very useful, while others

¹ In our operation of Kelotomy always remember that it only requires the cutting or severing but a few fibres of Poupart's ligament, and it is astonishing how very small an amount of this ligament, on becoming divided, will release a strangulated sac or intestine, so as to be readily reduced into the abdominal cavity. Bear in mind while dividing this ligament to cut as little as possible, for too much cutting here leaves our patient in a much worse condition for the descent of his rupture than before strangulation, and more liable to become again strangulated by a too free division of these ligaments.

² See figure of spica bandage on page 169.

HERNIA.



FIG. 42.—Cooper's Hernia Knife.

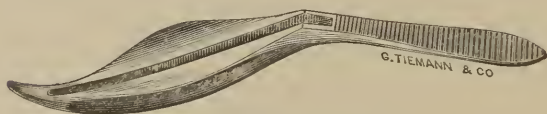


FIG. 43.—Peter's Hernia Director.

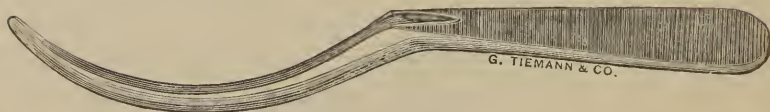


FIG. 44.—Hernia Director.

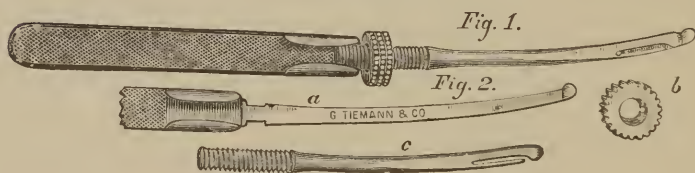


FIG. 45.—Allis' Herniotome.



FIG. 46.—Levi's Director.



FIG. 47.—Stewart's Hernia Knife.



FIG. 48.—Hinge Hernia Director.

are seldom resorted to. The author's instrument (p. 239) will take the place of all of them, as it simplifies the operation and gives great security from dangerous consequences. All that is absolutely necessary to use, I find, is a short bistoury, Dr. Golding Bird's Torsion forceps, needles armed with silver wire or carbolized cat-gut, and my herniatome. No director is needed as the herniatome combines director and knife.³³

OPERATION WITHOUT OPENING THE SAC.

The return of the hernial sac is not prevented merely by the narrowness of the constriction; it may also be due to adhesions which have formed either between the intestines and sac, or between the sac and the adjoining tissues. The existence of these anatomical and pathological adhesions led early operators to the belief that it was necessary, in these cases at least, to open the sac. Later surgeons have for many years, however, realised the dangers of such an operation, and have come to believe that there is not so urgent a necessity as was formerly supposed. They divide the stricture external to or without opening the sac. By this means the peritoneal cavity is not exposed, the danger from peritonitis is reduced, the inflamed intestine is not exposed to the atmosphere or to the hands of the operator, and the risk of hæmorrhage into the peritoneal cavity, from arteries that have been cut is entirely absent.³⁴ To say, however, that the sac is never to be opened, would be in my opinion as erroneous a conclusion as to say that the sac is always to be opened. Exceptional cases may occur in which the adhesions may be so firmly knit together that they cannot be broken unless the sac be opened. Here, as in every operation, there is the greatest demand for exact anatomical knowledge, for cool and deliberate judgment, for delicacy of manipulation,

and for refraining as much as possible from interference with the tissues surrounding our seat of operation.

The first to employ this operation of dividing the stricture without opening the sac was Jean Louis Petit. In his *Traité des Maladies Chirurgicales*, published in 1774 as a posthumous work, he says he operated in this way more than thirty years before 1750, and goes on to say, "Let us ask ourselves the question, of what use is it to open the sac? The only purposes that I know of are to expose the intestine and omentum in order to

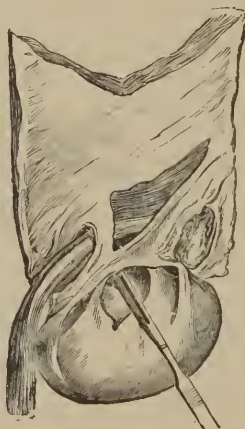


FIG. 49.—Key's Director passed beneath the seat of stricture of a Strangulated Femoral Hernia, outside of the sac beneath the fascia propria.

remedy morbid changes, if there should be any, to separate these parts if they should have become adherent, and to be able to handle the intestine, and push back hardened fæces or foreign substances. Now I except these cases; in all others, which are far more numerous, why open the sac? There is no indication for such a proceeding; while, on the other hand, the obvious advantages of omitting it are that we avoid exposing the protruded parts to the air, and escape the risk of wounding them; moreover, I shall show that, in respect to the consequence of the operation, it is desirable that the sac should not have been

opened. From these several considerations I conclude that it is better to enlarge the ring on the outside than from the inside of the sac." In all these arguments he is sustained by Sir Astley Cooper, who frequently in practice and in lecture advocated the method.

Petit's operation was as follows. Dissecting down to the sac, where it passes out from the ring, he insinuated between the ring and the sac a flat grooved director curved toward its end. A bistoury carried along the groove divided what was thus raised. If this division be not sufficient, it may be repeated until sufficient space has been made to allow reduction.

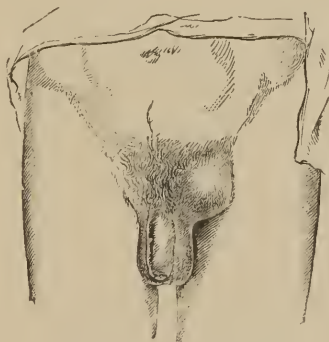


FIG. 50.—Direct Inguinal Hernia.

"Mr. Key recommends in inguinal hernia a mode of proceeding by which the surgeon may be enabled to divide the stricture either at the internal or external ring. He makes an incision of an inch and a half over the neck of the tumour, so as to lay bare the lower portion of the external oblique tendon, where it forms the ring. A small opening should then be made in the tendon just above the ring: by introducing the director it will be found whether the stricture is at the lower or upper opening. In the former case the director is carried under the margin of the tendon, which is then divided to a sufficient extent. If the

stricture should be at the upper opening, the incision in the aponeurosis of the obliquus externus must be enlarged so as to expose the lower margin of the two succeeding muscles with some fibres of the cremaster. The latter may be separated by the end of the director, which should be carried under the end of the transversus, the instrument being depressed upon the sac in order to carry its point under the border of the muscle, which may be divided to the required extent."

As to the statement which Petit so wisely made in his day, that the necessity of opening the sac because of adhesions, &c.,

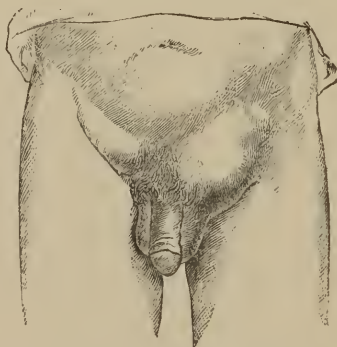


FIG. 51.—Oblique Inguinal Hernia.
Bubonocoele on right side, but passing through external ring on left.

was the decided exception to the general rule of cases, Dupuytren, in 1818, estimated that "six times out of nine strangulation is caused by the neck of the sac. Not much later H. Bérard raised the proportion of eight out of nine, and ultimately Malgaigne maintained, in 1840, that genuine strangulation was always caused by the neck, and that the cases of supposed strangulation by the rings were cases of inflammation of the hernial sac." E. Coulson (*Arch-Gén.* 1863, I., 273 &c.) in recommending the operation *without* opening the sac, advises that when the hernia is very large, and when the symptoms are more those of inflammation or gangrene than strangulation, or when

large adhesions have been formed, the intestine should not be reduced, but watched so that the sac may, upon emergency, be immediately opened.

TREATMENT AS GIVEN BY BERNARD AND HUETTE.

I have found the description of the operations upon strangulated Hernia, both the taxis and kelotomy, so admirably and clearly stated by Claude Bernard and Charles Huette (de Montargis) in their *Médecine Opératoire* that I have ventured to translate it in full. I trust this description will be as interesting and instructive to the reader as it has been to me.

“The operation for the reduction of strangulated Hernia was proposed and described for the first time by Franco in 1561. Adopted and practised latter by Ambrose Paré, and perfected and described as an operative method by Dionis.

“The instruments are as follows:—an ordinary straight bistoury, a convex bistoury, a probe-pointed bistoury, or Pott’s or Cooper’s herniotomy knife; (these bistouries have been variously modified,) a director, a pair of blunt scissors, and several dissecting forceps. Several fine sponges are necessary to soak up the blood during the operation; finally various pieces of dressing, lint, compresses, wax, &c.

“The operator places himself at the right of the patient, having assistants at his side and at the left of the patient to hold the instruments, to sop up the blood, and to take part in the operation as there is need.

“This operation having for its end the removal of the strangulation by section of the opening which causes it, is composed of several stages, in which successive incisions are made. First, the skin. Second, the subcutaneous envelopes of the hernia. Third, the hernial sac. Fourth, the constricting ring. Fifth, the reduction of the bowels.

“First.—*Incision of the Skin.* The incision should be made following the great diameter of the tumour, and proportional in extent to the volume of the Hernia. It can be made from within outwards; or from without inwards; when the skin is intimately united to the envelopes of the Hernia and cannot be detached by wrinkling. In this case it is necessary to make the incision with great precaution, and slowly to deepen it little by little. The essential point is not to cut the intestine. When the skin is soft, adhering but slightly to the deep parts, it is preferable to raise a fold of skin from the upper part of the tumour. The operator seizes one extremity of this fold, an assistant holding the other, and makes an incision from without inwards, or better from within outwards by entering the bistoury to its base, the edge upwards.

“This first incision has to do with the skin only, and should exceed the tumour in height and depth by a centimetre. It is sometimes necessary to make a crucial or T-shaped incision.

“After the incision of the skin, several small superficial arteries give off blood. Before continuing the operation, it is well to arrest this slight hæmorrhage by torsion and cold lotions.

“Second.—*Incision of the Subcutaneous Envelopes of the Sac.*—Much precaution and great delicacy of hand is required at this step. Some operators cut directly from without inwards, holding the bistoury like a fiddle-bow, the edge upon the tumour. The surer method is to raise the thin folds which envelope the Hernia, with a pair of forceps, and to make a horizontal incision, withdrawing each fold by the forceps. Then a director is introduced at the small opening thus made and pushed under the folds to the extremity of the tumour, and the bistoury, with its edge upwards, directed by the groove in the director, divides the envelopes of the Hernia down to the sac safely and without peril. Blunt scissors may also be employed.

“The number of these envelopes is variable. We have enume-

rated and described them in treating of the surgical anatomy of the inguinal and crural region.¹ But the age of the Hernia, the duration of the Hernia, &c., so modify the relations and nature of these envelopes that the normal anatomy cannot serve as a guide in investigations, and it is often extremely difficult to find the sac in the midst of the abnormal layers produced by the hernia.

“Serous cysts, deposits of fat, gangliotic abscesses, old sacs, &c. &c., may obscure the operation, and cause perilous uncertainty to the most experienced hand. Several signs are characteristic of the sac, viz., a smooth and polished surface, a spherical form, a fluctuation caused by an accumulation of lymph, the omentum or the intestine seen by transparency, &c.

“Third.—*Incision of Sac*.—The sac being found beyond a doubt, must be incised with care, in order not to wound the intestine. For this a fold of the sac between the circumvolutions of the intestine, or rather at the level of a portion of the omentum, is raised by forceps. This stage of the operation is rendered easy in the majority of cases by the lymph which bathes and distends the interior of the sac. An incision is made close to the forceps so as to make an opening through which to introduce the director, guided by which the sac is opened through its whole visible length, first above, then below. This opening ought to be made as much as possible forward and a little outward. It is of importance then to prove that the sac is opened. A certain quantity of lymph which escapes after the incision, the easiness of exploring the interior of the sac, with the director or the finger, when no adherence with the intestine exists; the intestine or the omentum floating freely and not adherent except at a point corresponding to the abdominal ring; all these signs together leave no doubt as to the nature of the sac which has been opened. Some Herniæ, hernia of the cæcum, for example, have no sac at all. When

¹ See pp. 51, 74.

this particular embarrassment occurs, which is extremely rare, it is always easy to recognise the intestines from the structure of its investments. In the more ordinary cases the intestine appears of a variable colour, according to the duration of the strangulation. Its surface is vascular, its colour is a reddish-brown more or less deepened, and marked in several places by a layer of plastic lymph. The omentum can be easily unfolded when it has contracted no adherence.

“Fourth.—*Kelotomy*.—Before proceeding to the division of the constricting ring, exploration of the neck of the sac should be made with the finger, and traction should be carefully made upon the intestinal protrusion, in order to effect reduction without kelotomy if possible.

“The situation of the strangulation being well known, and kelotomy judged indispensable, the operation can be performed in two ways.

“1. By cutting the constricting ring at the side where one does not expect the presence of vessels.

“2. By making several incisions at different points over the seat of the strangulation; these multiple incisions extending but a short distance, were adopted as a method by M. Vidal (de Cassis).

“Kelotomy is practised with a probe-pointed, straight, convex or concave bistoury. The straight probe-pointed bistoury is generally preferred, with the blade surrounded by a piece of tape, leaving bare only one or two centimetres of the extreme edge of the instrument which ought to be entered under the constricting ring. The bistoury may be guided by the index finger, or by a director. When the extremity of the finger cannot be pushed as far as the obstruction, the director must be used; but if the nail can be introduced under the frenum, the bistoury can be guided along upon the finger, at first flat then raised on edge, and the back of the instrument pushed by the

finger on which it rests, divides the constricting ring. The index finger can then be entered still more deeply, and the division carried still farther. See Fig. III.

"During the operation, the assistants keep apart the lips of the wound and hold back the intestines, which surrounding the blade of the instrument, might be wounded and hinder the operation.

"M. Vidal has prepared a grooved spatula to guide the bistoury. This director is extremely useful when it is impossible to follow the course of the bistoury with the eye. The end of the director is first passed between the hernial protrusion, and the part causing strangulation. The grooved face is turned upward towards the part which is to be divided, and on this face the bistoury is pushed forward, with the blade lying flat so that the edge cannot act in any way. In division the bistoury is turned upon its axis in such a manner as to raise the bistoury on edge, scraping as well as cutting the ring. This director protects the intestines from the edge of the blade, and keeps them at a distance.

"We have said before that reduction should be tried before division is performed, but we must not forget that the location of the strangulation is more often at the neck of the sac than at the aponeurotic ring. On this account the Hernia may be reduced with the sac, and yet the strangulation may exist at the neck after the reduction into the abdomen. It is of importance therefore to be well assured of the precise location of the strangulation, and not to forget that some hernial sacs have multiple necks, and that the location of the strangulation may be very extended, and reach as far as the superior ring of the inguinal canal. Only by feeling and successive divisions can the operator discover the difficulties which may complicate the operation.

"There is much difference among authors, concerning the

direction and the extent of the division. When the strangulation is located at the exterior ring, and the neck of the sac can be drawn out of the canal, the division is always easy and without danger to the epigastric artery. But when the strangulation is deeper, the impossibility of knowing whether the hernia is internal or external, ought to render the operator prudent. The division above is less dangerous to the organs which ought to be respected. At no part should the incision be more than four millimetres, in order to avoid puncturing the artery. In the case of external Hernia, the division being from without safely admits of a larger incision, which should always be proportional to the organs to be reduced. To obtain these results it is often preferable to resort to the multiple method adapted by M. Vidal.

“*Multiple Division.*—When it is necessary to greatly dilate the abnormal opening, in order to avoid a too extensive incision, causing danger of hæmorrhage, M. Vidal proposes to make three, four, or a greater number of incisions of two to three millimetres.

“*Method of M. Malgaigne.*—M. Malgaigne makes the incision not in the sac and scrotum, but at the place where the strangulation appears to be located, prolonging the incision above and below to an extent which the obesity of the subject and the volume of the Hernia demands. All the tissues are then divided as far as the peritoneum, and on this account there is nothing to be feared from the vessels which one has under his eyes or puts aside at will. If it is discovered that the strangulation is caused by a fibrous opening the Hernia is reduced without touching the sac. If not, the neck of the sac is divided by short cuts from without inwards; or better, if the stricture is very firm, a small incision is made either above or below the neck of the sac, which is raised by the director that guides the incision.

“M. Malgaigne found by this proceeding, before all things, the

advantage of allowing the surgeon to see what he had done ; in the second place of reaching the strangulation by the shortest road and the least possible incision ; and finally, of respecting the scrotum and sac, and avoiding suppuration and cicatrization of a wound entirely useless.

“ In support of his method, M. Malgaigne cites a case of very voluminous scrotal Hernia. The neck of the sac was located at the level of the abdominal ring ; the neck of the sac was opened and the sac refilled, the first day with a certain quantity of liquid, which was re-absorbed in a measure, when the inflammation of the upper wound was allayed. The wound healed without accident.

“ Fifth.—*Reduction*.—In the case of intestinal Hernia, when the intestine is healthy, it is necessary to draw it a little forward to break up any adherences which may exist, when they are weak ; to cause by gentle pressure, the gas which fills the intestine to pass into the abdomen, and to return the portion of the intestine near the ring portion by portion. If the intestines are accompanied by a portion of the omentum, this is reduced last.

“ When gangrene has begun in a portion of the intestine, the indications to be followed are various, according to the extent of the disease. If any doubt exists as to the existence of gangrene, M. Vidal advises that an incision be made with the bistoury, upon the diseased intestine, of small extent and very superficial. If circulation is active, a large drop of blood immediately forms at the small wound ; if on the contrary the intestine is gangrened, the surface of the wound remains dry. In the first case the intestine is reduced, in the second not. In case of doubt the gangrened portions should be retained at the level of the ring. If there is gangrene, the faecal matter can escape at the abdominal opening.

“ When the intestine is gangrened to a large extent, we must

retain the two healthy ends at the ring to facilitate the passage of faecal matter at the superior end from the abdominal opening, so as to establish an artificial anus which will heal later. It may be possible to excise the gangrened parts, and after reuniting the healthy parts, to reduce the intestine as a whole.

“When it is necessary to establish an artificial anus, the adhesences which unite the end of the intestine to the neck of the sac must be gently broken up. The destruction of these adhesences will allow the intestine to enter the abdomen. If the strangulation prevents the faecal matter from escaping freely, a speculum may be introduced at the superior end of the intestine, and if this introduction is impossible on account of the adhesences which must be regarded, division should be made, with precaution, in front of the sac.

“Gangrene of the omentum, according to the extent and volume of the omentum involved, requires various methods of operation. When the gangrened portion is sufficiently extensive, the omentum is unplaited, divided at the level of the healthy parts, and after the ligature of the vessels, secured at the opening of the ring.

“*Crural Hernia.*—When the cæcum and the superior iliac region of the colon are involved by their extra peritoneal part, they form a Hernia without a sac. Beyond this exceptional case, Crural Hernia is composed almost of the same elements as Inguinal Hernia. They are first directed downward in the sheath of the femoral vessels, then across the lamina of the fascia cribriformis; then its direction changes, and it remounts toward the abdomen under the skin and the layers of the subcutaneous tissue.

“In the majority of cases the neck of the sac is formed at the level of the opening of the fascia cribriformis, and here also the strangulation takes place, caused by the aponeurotic ring of the fascia cribriformis. But when the strangulation takes place at

the superior orifice of the canal, or in the canal, it is always the neck which is strangulated. (Malgaigne.)

“That which we have said of taxis in the case of Inguinal Hernia being applicable to Crural Hernia, we will not review it. We will only observe that it is necessary for the Herniæ to follow in a reversed way the sinuosities which they have traversed.

“*Kelotomy*.—A simple or reversed T-shaped incision is made according to the needs, parallel to the great diameter of the tumour. The different tissues which cover the Hernia having but little thickness, we must proceed with great precaution, and it is often impossible to raise a fold of skin from the surface of the tumour. The ‘fascia propria’ which covers the sac is very slight, and may be taken for the sac itself; and some fatty collections lining the sac, and seen by transparency under the fascia propria, may be mistaken for the omentum, and render this error easy. It is of importance, then, that the incision of the layers which cover the Hernia should be made with caution, and division should never be performed from the exterior of the sac when the neck of the sac is the cause of strangulation. Recent researches of modern surgery have caused the older methods of kelotomy to be given up. The labors of M. Demeaux have shown that the location of the strangulation was at the aponeurotic ring of the fascia cribri-formis, and that the neck of the sac never caused strangulation of the Hernia. We can therefore with safety make an incision from without at the upper part, but below we might meet the saphenous vein. If after the division of the aponeurotic ring it is proved that the neck of the sac causes the strangulation, we can easily draw it forward and divide it.

“*Umbilical Hernia—Kelotomy*.—Umbilical Hernia may become obstructed or strangulated, and call for the operation of kelotomy.

“We must remember that the envelopes are very fine, and

that the sac contains but little lymph. These particulars render the operation difficult.

"The operator very carefully makes an incision of a + or T shape. Umbilical Hernia being seldom strangulated at the neck of the sac, some authors recommend only a division of the fibrous ring without touching the sac, in order not to expose the peritoneum to inflammation. This should be followed in the case of large Herniæ when it is not necessary to lay bare the intestine.

"A multiple division is preferable to single division, and if only a single incision is necessary, it should be directed upwards and to the left, in order to avoid the course of the urachus and the umbilical vessels."

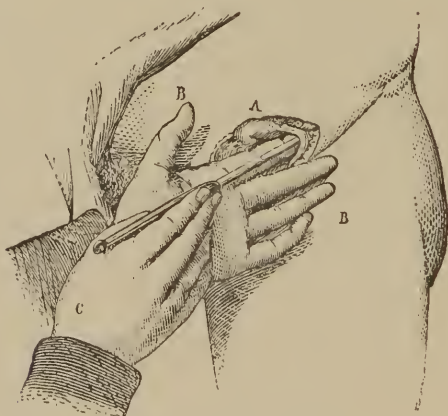


FIG. III.—Operation of Kelotomy.

To illustrate the operation still further, I would introduce the following illustrations from Gay's work on Femoral Hernia, published in 1848. The plates were reproduced by Mr. Oxenham, a pupil of J. D. Cooper, 188 Strand.

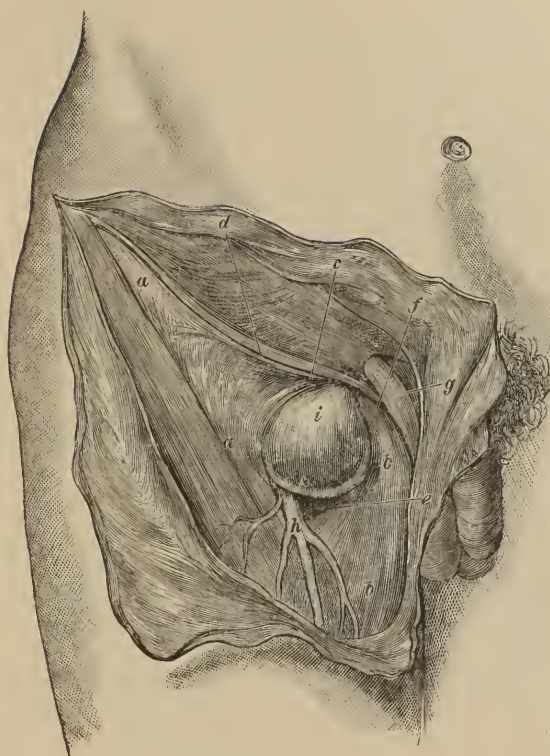


FIG. 52.

The hernial sac and parts, the subject of this drawing, were discovered in the course of a dissection. The tumour did not present those external indications that led to a suspicion of its existence, until the superficial and cutaneous fascia had been cut through. The engraving was made from a cast and drawing of the parts taken by Mr. E. Wilson, and is well adapted to show the parts prior to their alterations by the processes of disease. The sac is denuded of its fascia propria. Any further description, but for the sake of junior students, would be superfluous.

a a.—Upper layer of the iliac portion of fascia lata.

b b.—Pubic portion of the same fascia, or *pectineal* fascia, forming the floor of the *femoral fossa*.

c.—Falciform process, and portion of the border of the saphenous opening.

d.—External or semilunar portion of the same border.

e.—Burn's ligament, or pubic portion of the arch formed by the lower border of the same opening.

f.—Inferior pillar of the external abdominal ring; or that portion of the crural arch which terminates upon the tuberosity of the pubis and adjoining portion of the ileo-pectineal ridge.

g.—Spermatic cord.

h.—Saphenous vein.

i.—Hernial tumour.

A black line shows the situation and direction of the incision which is made through the integuments into the *femoral fossa*, for the new operation.

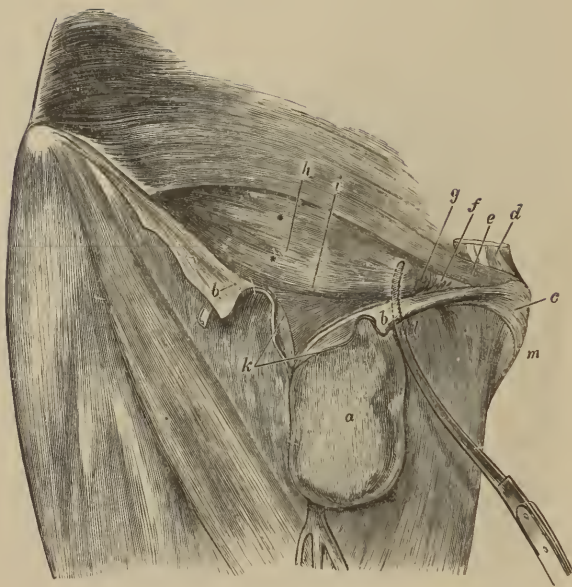


FIG. 53.

Represents a hernial tumour and the adjacent parts of the thigh as they are displayed by the removal of the superficial fascia and the contents of the *femoral fossa*. The crural arch and upper layer of the iliac portion of the fascia lata have been divided and turned back, to show the deep layer of that fascia, and its relations to Hey's ligament. The knife is passed from the femoral fossa behind those seats of stricture, which are here seen.

a.—The hernia tumour with its cribriform covering.

bb.—The crural arch divided and turned back.

c.—Pubic insertion of the tendon of the external oblique muscle.

d.—Tendon of rectus.

e.—Pubic attachment of the conjoined tendons of the internal oblique and transversalis muscles.

f.—Portion of Gimbernat's ligament, formed by the outer pillar of the external abdominal ring.

g.—Portion of Gimbernat's ligament, formed by the falciform process of the fascia lata.

h.—Situation of the band of fibres belonging to the internal inguinal ligament of Hesselbach, below the *under layer* of the iliac fascia lata.

i.—The femoral, or Hey's ligament; or the *deep crural arch*.

k.—Upper lamina of the iliac portion of the fascia lata, divided vertically and thrown back, in order to display the *deep lamina*, with Hey's ligament, and its continuity to the arched margin of the internal oblique muscle.

l.—The femoral fossa.

m.—Process from the deep abdominal fascia which completes the upper arched border of the saphenous opening on the pubic side.

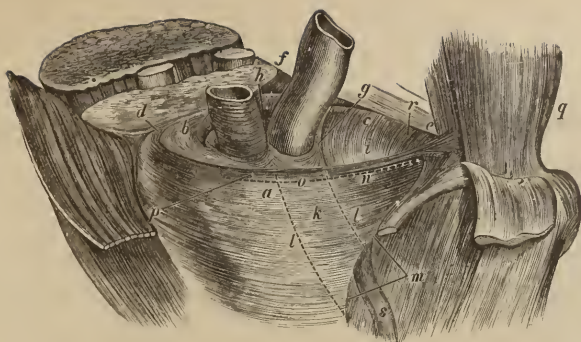


FIG. 54.

- a.*—The front wall of the femoral sheath, as displayed on the careful removal of the iliac fascia lata.
b, c.—Its iliac and pubic walls.
d, e, f.—The angles formed by the union of these walls.
g, h.—The septa by which the sheath is divided.
i.—The upper orifice of the crural canal, or crural ring.
k.—The venous compartment of the sheath.
l, l.—Lines showing the direction of the septa of the sheath,—the outer one being between the artery and vein.
m.—The front margin of the lower orifice of the sheath.
n.—The crural canal.
o.—Dotted line, showing the relative position of Hey's ligament to the front wall of the sheath.
p.—The band of fibres appertaining to the front wall of the sheath, described as the "fibres crassiores" of the internal inguinal ligament of Hesselbach.
q.—Tendon of the rectus.
r.—The pubic margin of the crural ring: the septum crural has been pushed before a hernial sac, by which the canal has been occupied.
s.—The terminal portion of the saphenous vein



FIG. 55.

The front of the thigh, with a hernial tumour, with dotted lines showing the situation of the crural arch, and the margins of the saphenous ring.

- a.*—Edge of process of fascia lata.
b.—Situation of the spermatic cord.
c.—A line representing the seat and direction of the external wound for the new method of operating.
 The line of incision is represented, as in Fig. 52, in black.

AUTHOR'S MODIFICATION OF THE OPERATION OF KELOTOMY.

Before closing the abdominal walls that we have divided in our operation with the knife, I would recommend that we apply to the edges of the rings Lugol's solution of iodine, the fluid extract of white oak bark, or the following, which I think far superior:—

R. Ext. Quercus Albæ, grs. xii.

Proof Spirit, ʒj.

Morp. Sulph. grs. iv.

Sulph. Ether, ʒiv.

M.

This mixture is to be applied with a long soft camel's hair brush, or by means of a bit of absorbent cotton, and will cause an effusion of lymph over the wounded parts, which effusion will consolidate the rings with new tissue not unlike the results of our operation on reducible Hernia by subcutaneous injection. Whether by this means we obtain a cure or not, we shall at least do no harm from our simple application, and may dispense with the succeeding subcutaneous injection.

Dr. Derby, of Vermont, has succeeded in effecting a cure in a strangulated Hernia by means of the application of iodine, which I have mentioned.

In case we use iodine, or the preparation of oak bark I have given, I would advise that we apply no moisture on our compress for the first twenty-four hours. Powdered ice in a bladder, or rubber bag, would be preferable as an application if inflammation sets in or is feared; in fact I think very highly of such an application as a constant dressing in all cases of inflammation after any surgical operation of any importance over the abdominal region.

NEW HERNIOTOMY KNIFE.

In place of the ordinary Herniotomy knife I have adopted an instrument devised by myself, and here figured.¹

In shape it is like a bistoury of the ordinary form, as made by Milliken of London. Instead of a cutting blade, I have adapted to it the narrow saw used by Dr. George F. Shrady, surgeon to the Presbyterian Hospital of New York. This saw can be withdrawn into the hollow shaft of the instrument, which can then be used as an ordinary groove director. When it has been introduced beneath the ligament to be cut, this saw can be pushed forward and used to make our necessary incision.

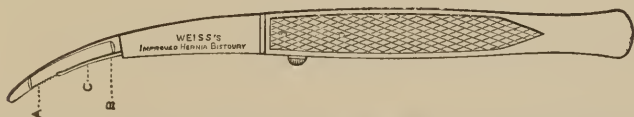


FIG 56.—This is a probe-pointed bistoury, having the edge *AB* serrated and protected by a sliding rod *c* which keeps it from cutting during its introduction, but is withdrawn when the desired region is reached.

We shall, by this means, serrate the ligament instead of cutting it smoothly, and shall avoid, or at least lessen, the danger of severing the epigastric, or obturator arteries, or branches from them.

The ligaments being roughened will consolidate under the effusions of lymph much more readily than they would if the cut had been smooth; and the arteries, should they happen to be injured or severed, will from their lacerated edges contract like the edges of a lacerated wound with very little hæmorrhage and danger to the patient. Such minute details, if we would meet success, should always be as faithfully attended to as the major and seemingly more important steps in the operation. To illustrate the safety of these operations where the ligature of arteries is not so indispensable as once was thought, I insert the

¹ See p. 377.

following quotations upon surgical operations without ligatures, from one of my communications to the *Boston Medical and Surgical Journal*. This only brings to our notice the old and well known fact of the contractility of lacerated vessels when severed by sawing or tearing them asunder.

In 1872, Mrs. —, of Kittery, Maine, aged about thirty-eight, of light, sanguine complexion, mother of two children, had a tumour of the left breast about the size of a duck's egg, which began soon after the cessation of lactation with her last child. This tumour made its appearance on the inner side of the left breast just below the nipple, which felt hard and doughy to the touch. The nipple was retracted, and there was a deep, dark areola around it. Her suffering was so great that she was unable to sleep, and it had occasioned a general loss of appetite and strength.

She was placed under the influence of ether, and the usual elliptical incisions were made. In so doing branches of the inferior mammary artery were laid bare, and traction was made upon them, previous to their general division with a saw-like movement of the bistoury. Retraction of these arteries took place, completely closing them against any hæmorrhage. Some slight hæmorrhage from smaller vessels was controlled by torsion. The parts were now brought together without the use of any ligatures. The wound was closed with five silver sutures and adhesive plaster, and healed almost entirely by first intention.

In the fall of 1878 a young girl from Attleboro', aged fifteen or sixteen, received an injury by a stone thrown against her breast, where a hard swelling arose and developed into a cystic adenocèle. The whole breast became much enlarged, swollen, and painful just above the nipple. The tumour and the hard swelling continuing to grow in spite of treatment, it was decided to amputate the breast. Being called to perform the

operation, I proceeded after etherisation to remove the greater portion of the breast by making semi-elliptical incisions, keeping the vessels well on the stretch. Her attending physician wrote me that the entire wound healed by the first intention, or at the primary dressing without any suppuration. This patient being young and in vigorous health, well nourished, and with breasts enormously large, the circulation was very free, and the tendency to hæmorrhage much greater than in the first case, where continued suffering had caused a reduction in the vital forces, and at the same time enfeebled the circulation.

This operation shows the contractile power of the muscular coats of the arteries when traction is made on them before their division. To illustrate still further how much can be done in many operations without the use of ligatures by taking advantage of this contractile power of the arteries, I will relate the following case:—

Mrs. H., of Concord, Mass., aged sixty-eight, on November 7, 1878, consulted me for a large fatty, bell-shaped, fibroid tumour which grew from the glutæus maximus, was suspended by a pedicle of about two and a half inches in diameter, and extended nearly to her knee on the left side. It had existed over twenty-five years, and a portion of the inferior part had sloughed obliquely off, leaving a large ulcerated surface which was discharging a very offensive fluid. The constant weight—about three pounds—had caused a prolapsus uteri, together with a partial prolapsus of the anus and bladder. This tumour, from its discharge and the burden of carrying it, as the patient was very slight in stature,—was very weakening and enfeebling.

On the 12th of November, after etherisation, I operated on the tumour, with the assistance of Dr. M. E. Webb, of Boston, by making two longitudinal elliptical incisions as close as convenient to the pedicle, and removing all the attachments except where the arteries ramified into the substance of the tumour.

These arteries were very large, and accompanied by a vein fully equal in size. Before the final division of the vessels I made retraction, placing them greatly on the stretch, and then proceeded slowly to divide them with a saw-like motion, as related above. Full contraction and closure of the arteries took place. The wound was now brought together, and coaptation effected by silver sutures and Dr. Martin's United States army adhesive plaster. It healed almost entirely from the first dressing, excepting a small portion, about three quarters of an inch of the lower part of the incision, which was designedly left open for drainage, and so kept by a few threads of coarse saddler's silk. The patient in two weeks was able to return home perfectly healed, with her prolapsed organs restored to their natural conditions, the uterus being supported with a Hodge's hard rubber pessary. She was ordered to take quinine and iron, and when she visited me in the winter she had gained so much flesh and strength that she considered herself comparatively young again.

Neither in major nor minor operations have I had secondary hæmorrhage by this method so frequently as when I have been obliged to resort to ligatures, and I have had better success in the healing, since the parts so brought together have generally united by first intention. My attention was called to this contractility of the arteries from the fact that in early life I noticed that in many lacerated wounds we have but little hæmorrhage where we should have supposed from the size of the arteries that there would be much, and that such wounds, when proper coaptation could be had,—when freed from dust and oil,—would generally heal by first intention; but where ligatures, even though small, were used in fresh wounds, suppuration took place almost invariably.

CHAPTER X.

RECENT OPERATIONS FOR HERNIA.

SINCE the appearance of the first edition of this work, the following new operations have been made public. In order to present them fairly, I have given them in full detail.

Immediate Cure of Inguinal Hernia by a new Instrument.—

By the courteous permission of W. Dunnett Spanton, M.R.C.S., Surgeon to North Staffordshire Infirmary, England, I reprint from the *British Medical Journal* of December 11, 25, 1880, and January 8, 1881, the following essay :—

When we consider for a moment the enormous number of cases of hernia met with in practice,—those applying to the truss societies of London alone, numbering over nine thousand a year,—it seems strange that so little comparatively has been accomplished in attempting to cure such cases permanently. Most surgeons seem to rest contented with some palliative measure, which, sooner or later, is tolerably certain to be found wanting at the critical moment, when strangulation is about to take place. The ancients were in their generation somewhat wiser; for, fifteen hundred years ago, the operation for radical cure was comparatively common; and long before that (about B. C. 400), Hippocrates described the operation, which, for aught we know, may have been practised even before his time.

The different methods which have been practised for the

immediate or radical cure of hernia may be roughly classed under four heads, viz., 1. Contraction of skin and sac by excision, cautery, or ligature; 2. Closure of the sac by adhesive inflammation; 3. Plugging the inguinal canal; 4. Bringing the walls of the canal together.

1. Among the old surgeons, the first method was the only one employed. Celsus says that, in his day, the surgeon opened the sac with a sharp instrument, took hold of it, and, after putting back the intestine, cut the sac, then tied the spermatic cord and removed the testicle. He then took away part of the scrotum, and reunited the lips of the wound, so as to form a firm cicatrix.

Paulus Ægineta followed Celsus, but ligatured the sac before cutting it, and sometimes applied the actual cautery also; and in cases of bubonocoele, he advocated cautery alone, applied to the skin sufficiently to penetrate the parts beneath, — “being guided as to its extent,” he says, “by a skilful conjecture.”

Oil of vitriol used as a caustic, by being repeatedly applied over the inguinal ring until it penetrated all the soft tissues, was in vogue in the early part of last century, and was as barbarous as it was ineffectual.

Another plan, invented by Berault, was styled the *punctum aureum*. See page 102. The rupture was reduced, the sac laid open, taken hold of with pincers, and a gold wire passed through it, which was then twisted and cut off. Other kinds of wire were subsequently employed by other surgeons. At the best, this operation could only convert a complete into an incomplete hernia; but it appears seldom to have effected even so much. About this period, a much more barbarous modification of this operation was in vogue among the Turks, which is fully described in Arnaud's work.

2. Of the second series, the best example is that of the seton. Various substances have been employed with the object of set-

ting up inflammatory action in the interior of the sac, so as to cause the sides to adhere, and so prevent protrusion of the bowel. Silk thread, sponge, injection of irritant fluids of various kinds, were at different times employed for the purpose by various surgeons. The method, by whatever variety of practice carried out, appears to have been even less efficacious than the barbarous practice of the ancients, and, almost, if not quite, as dangerous.

3. In the third class, Wurtzer's operation affords the best illustration; that of Gerdy being very similar. See pages 104 and 106. In the latter, the skin of the scrotum, with the fundus of the sac, is invaginated by the finger of the operator into the inguinal canal, and a curved needle armed with thread is passed through the skin of the groin on each side of the finger, and the skin retained in its place by means of the suture until it becomes adherent. Sometimes caustic ammonia was used, in order more certainly to obtain union between the two invaginated skin-surfaces. Wurtzer used instead of the finger a wooden plug, retained *in situ* by means of needles passed through the skin at its extremity, and fixed externally to a corresponding piece of wood, so placed as to produce sufficient compression of the intervening tissues as to secure their adhesion to each other. The records of successes after these measures are, I believe, comparatively few; and I have myself seen some instances in which the rupture has been made seriously worse by Wurtzer's operation.

4. The fourth plan differs materially from the foregoing, in providing the remedy which Sir W. Lawrence pointed out as being required to contract the tendinous opening (*Treatise on Ruptures*, by W. Lawrence, 1816, p. 94). The idea of bringing together the pillars of the inguinal ring in such a way as to restore the normal valve-like shape, is based on true anatomical principles, and to Mr. John Wood must be ascribed the great credit of having reduced these to valuable practical results. See page 108 of the present work. Wood's operation, however, con-

sists not merely in approximating the pillars of the ring, but in the subcutaneous invagination of the tissues which are intended to fill up the abnormally expanded opening. Stress is laid by Mr. Wood on the fact that, "to ensure success, complete union must be established along the whole length of the canal" (*On Rupture*, by John Wood, p. 88). This statement first led me to consider how far it might be feasible to secure such a result with greater simplicity and certainty. In using the wire sutures of Mr. Wood, as ordinarily applied, a hold is secured on the pillars of the ring at two points only, while the invaginated tissues are forcibly drawn up in such a way as, in some measure, to defeat the object the surgeon has in view, of approximating the sides of the canal as much as possible. By means of the operation I propose, you will see that these drawbacks are overcome. (Fig. 57.) The points of security are multiplied, and the invaginated plug, being rather cylindrical than conical, is retained in position in such a way as to permit the walls of the canal to come as close together as possible. The instruments required are very simple, — a thin strong knife, like a tenotomy knife, for separating the skin from the subjacent tissues; and the screw instrument (Fig. 58.) shaped like a corkscrew, with a flat point and movable handle, nickel-plated. The screw is made rather broader near the point, tapering somewhat towards the handle, and should be sufficiently strong not to break, but yet as thin as may be consistent with strength. The instruments in box are represented in Fig. 59.

The mode of performing the operation in a case of ordinary oblique inguinal hernia is as follows. The patient must be in good health, have an aperient the day before, and an enema on the morning of operation. If necessary the pubes must be shaved. Under the influence of an anæsthetic the hernia is carefully reduced, and not allowed to come down during the operation. An incision is made in the skin of the scrotum large

enough to admit the forefinger easily, over the fundus of the hernial sac, generally about two inches below the spine of the



Fig. 57.



Fig. 58.

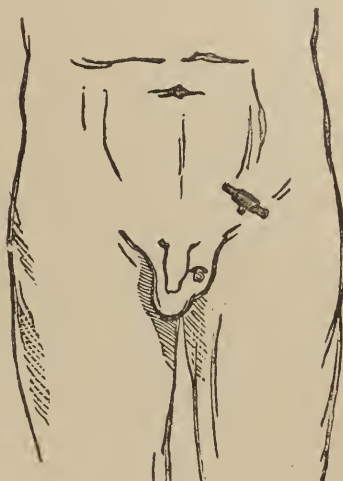


Fig. 61.

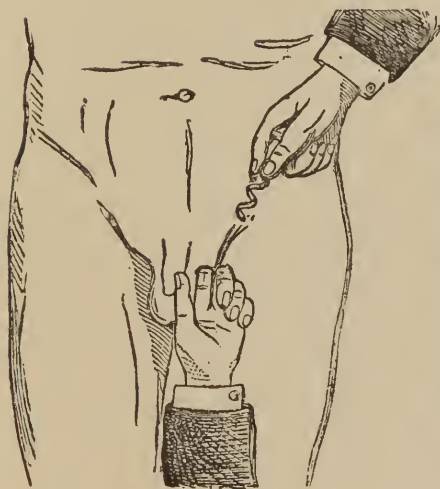


Fig. 60.



Fig. 59.

os pubis; and the skin is separated from the parts beneath by means of the blade or handle of a narrow scalpel, to an extent determined by the size of the hernia, and that of the inguinal

canal. The operator standing on the left hand side of the patient, the forefinger of the left hand is passed up to the internal abdominal ring, invaginating the fascia and hernial sac to the same extent. A careful examination is now made of the surrounding structures, the position of the vessels clearly made out, the size and shape of the abdominal rings noted, as well as the length of the canal. This is necessary, in order to have an instrument of the proper size. The left forefinger being retained in the hernial canal, protecting the spermatic cord, and at the same time closing the internal ring, the screw instrument, previously dipped in carbolic acid, is, with the right hand, thrust through the skin of the groin so as to transfix the aponeurosis of the external oblique muscle, at a point somewhat above that at which it is intended to pass through the conjoined tendon. (Fig. 60.) Having given the instrument one half turn to the right if a right inguinal, and a whole turn if it be a left hernia, it is next made to pierce subcutaneously the conjoined tendon of the internal oblique and transversalis muscles as high up as can safely be reached, the left forefinger carefully guarding the point so as to avoid wounding the vessels or peritoneum. This part of the operation must be executed cautiously and deliberately. It will be then found that as soon as a hold has been secured by the instruments the internal ring is practically closed. Another turn is now given to the screw, causing it to pass through the invaginated tissue — whether consisting of fascia or sac, or both — and it is again passed through the external pillar, and then across to the internal pillar of the external ring, and another turn given if possible, so as to bring the point out at the wound in the scrotum. The handle should then lie flatwise on the abdomen, and the point of the instrument be protected by a round piece of solid India-rubber, or by winding round it some carbolized gauze. (Fig. 61.) A light pad is then placed over the part, and a bandage carefully applied.

The operation may be performed under Lister's antiseptic method, as in two of the cases (IV. and VII.) I have to record; but it is well then to leave the instrument *in situ* rather longer. The results are equally satisfactory if this precaution be observed, and there is, of course, less danger from any septic influence.

The subsequent treatment is very simple. After a period varying from a week to a fortnight, a certain amount of inflammatory action will be observed along the line of the inguinal canal where the instrument lies, and more or less discharge takes place from the wounds. The amount of induration excited will be the guide as to the time for removal of the instrument; but a week has been usually found sufficient. The removal of the instrument is easily effected, as the suppuration which takes place along its course serves to loosen it somewhat; and, by keeping it well oiled from day to day, it is easily withdrawn. The wounds will readily heal under any simple dressing, with pad and bandage. A truss may be worn for a time, as the adhesions will of necessity not be very firm at first; but, in most of the cases I have operated on, this has been dispensed with without any ill results.

The aim of the operation is to bring together the pillars of the hernial canal, and at the same time to plug the opening in such a manner as to shut it off from the peritoneal cavity on the one hand, and, on the other, to form an impassable barrier against any further descent of the bowel. So long as the general peritoneal cavity is not interfered with, so far is danger averted; and if the hernial canal be effectually closed throughout, so to the like extent is the cure complete.

The operation is simplicity itself to any one accustomed to operative surgery; and with regard to the danger attending it, I can only say that it has now been performed by myself and my colleagues in thirteen cases, in not one of which has any serious symptom been observed, the highest temperature recorded being

101.2° Fahr. ; and, in eleven of the cases, the cure has been complete ; in the remaining two the patients have been greatly benefited. I think, therefore, I am justified in saying that it is a simple, a safe, and a very efficient method of curing suitable cases of hernia.

I append a record of all the cases in which the operation has been performed up to the time of writing this paper.

APPENDIX OF CASES.

CASE I. *Right Oblique Inguinal Hernia*. — W. H., aged eighteen, a farmer's son, living in Shropshire, working on the farm, was seen at Hanley on December 12th, 1877. He was a healthy, muscular lad, had always enjoyed excellent health, but for about a year had been the subject of right oblique inguinal hernia. I saw him in consequence of strangulation of the hernia, caused by lifting some heavy baskets from a market-cart. After fomentations and a dose of opium, the hernia was reduced by taxis ; and, keeping him quiet until December 5th (four days after), I performed the operation for radical cure, in the manner already described. The rupture was small, and the opening of the internal ring was small also. Ether was administered by Mr. W. A. Frost, who assisted me, and the operation was performed without any difficulty. He suffered no pain worth mentioning, and had no constitutional symptoms. No medicine of any kind was given until on the third day a dose of castor-oil ; after which time the bowels acted naturally. On the tenth day the instrument was removed, both of the openings in the skin at that time discharging a little pus, and the scrotum and testis of the same side being swollen. There was a firm band of adhesion along the whole line of the inguinal canal. The wounds quickly healed under the application of terebene oil, and a hard thickened plug remained, completely closing the hernial opening, so that no

impulse could be felt on coughing. He wore a truss for better security. I saw him about two months afterwards, when the adhesions remained quite firm. About six months afterwards, he felt so secure that he gave up wearing the truss; and during some violent exertion in the hay-field, there was a partial giving way of the adhesions, with a tendency to a return of the hernia. He has since that time worn a truss, and had no further trouble. In this case I think I was rather too timid, and failed to take as secure a hold of the abdominal rings as I ought to have done; but, as a test-case, the result was so far a source of satisfaction to me, inasmuch as it showed that the operation could be carried out without a symptom to cause any uneasiness.

CASE II. *Congenital Hernia in a Child*.—T. B., aged four years, was healthy and strong, and had a right congenital rupture. On admission into the North Staffordshire Infirmary, on October 2d, 1878, there was a large scrotal hernia of the size of a large duck's egg, and two fingers could be easily passed through the hernial opening. He had worn a truss for some time, but it was quite impossible to keep up the hernia, and it would even force down under the pressure of the fingers. On October 7th, 1878, chloroform being administered, I operated, some of my infirmary colleagues being present. In this case, there being no proper sac, the scrotal fascia and tunica vaginalis formed the invaginated plug; and it is noteworthy that, with the free communication with the general peritoneal cavity which existed, there was no sign whatever of peritoneal irritation. The child suffered from chloroform-sickness for some hours, but afterwards progressed most favorably. He made no complaint of pain except when disturbed, and no constitutional symptoms showed themselves. Considerable cedema of the scrotum followed; and, on October 13th (six days after operation), there was free sup-puration from both the openings. The instrument was removed under chloroform. A hard thickened mass of tissue occupied

the inguinal canal, and, on straining or coughing, no impulse could be felt. On the 18th the wounds were quite healed, and the child was in perfect health. The opening was securely closed, and remains so.

CASE III. *Right Oblique Inguinal Hernia*.—A. S., a warehouseman, aged fifteen, was admitted into the North Staffordshire Infirmary, under my care, on October 29th, 1878. Three weeks before admission, while lifting a weight, he first noticed the hernia. There was a small right inguinal hernia, which had never been strangulated. The general health was good. After the usual preparation, I operated under ether on November 9th. Considerable pain was complained of after the operation, which was at once relieved by loosening the bandage, and the administration of a hypodermic dose of morphia. He had no sickness. On November 12th there was considerable œdema of the scrotum, and some purulent discharge from the wounds, especially the lower one. He slept well, and the general health remained good. On November 18th he complained of some abdominal pain on the right side, with tenderness in the right inguinal and iliac regions. There was a slight erysipelatous blush in the same neighborhood, with moderate discharge of pus. The temperature rose for the first time to 101.2° Fahr. After an enema the bowels acted; the instrument was removed, and a warm water pad applied, with immediate relief. From this date the pain, swelling, and discharge gradually subsided, so that, nineteen days after operation, he was able to be shown to a meeting of the Staffordshire Branch of the British Medical Association. He left the hospital about a fortnight afterwards, when the occlusion of the inguinal canal was so complete that no truss seemed to be needed. In this instance much more irritation was set up than in either of the preceding ones. The result showed, however, that it was purely local; and this, of course, within certain limits, is likely to prove beneficial rather than injurious in its ultimate effects.

CASE IV. *Left Inguinal Hernia*. — Annie B., aged nine, living at Stoke, was admitted, under my care, into the infirmary, on December 7th, 1878. She was a ruddy, healthy-looking, plump girl. Her mother stated that while playing, about a year previously, the hernia appeared. It was readily reduced on lying down, was about the size of a small hen's egg, and had never been strangulated. The hernial opening admitted one's finger easily. With the ordinary preparations, the operation was performed on January 1st, 1879, under chloroform, and with strict antiseptic precautions under carbolic spray. Carbolized gauze was used to protect the point of the instrument. The temperature never rose beyond 99° Fahr. There was an entire absence of sickness or other constitutional disturbance. On January 4th the bowels acted naturally. On the 8th the instrument was removed (the temperature rising on that day, affording us a good indication for doing so). There was some induration along the track of the screw, and a few drops of pus at each opening. On January 13th the wound was again dressed under spray. There was very slight discharge; a firm cord was felt along the line of the inguinal canal. There was no tendency to any protrusion. On January 16th the antiseptic dressings were left off. The wounds were quite healed, and firm. She was kept in bed a few days, and a pad and bandage applied. She left the hospital ten days afterwards, perfectly well, and not requiring a truss. She has continued sound up to the present time.

CASE V. *Right Oblique Inguinal Hernia*. — S. T., aged eleven, a schoolboy, was admitted into the infirmary, under the care of my colleague, Mr. Folker, on January 7th, 1879. Six months before admission the hernia was caused by a strain. The tumor was small, the internal ring easily admitting the point of the finger. On January 11th the operation was performed under chloroform. On the 14th there had been no complaint of pain; the discharge was slight, and the temperature and pulse normal.

On the 17th there was some œdema of the scrotum, and increased discharge, with slight pain. Castor-oil was ordered. On the 18th the instrument was removed, some little difficulty being encountered in taking the gauze off the point. On the 26th he was allowed to get up, with a pad and bandage applied. The inguinal opening was firmly closed by a hard band, and there was not the slightest impulse to be felt. On February 10th he left the hospital cured. The boy came to the infirmary three weeks afterwards to show a "lump" which had appeared where the hernia had been. This was found to be fluid — an artificial hydrocele of the cord, in fact — which was conclusive in showing not only that the internal ring was closed, but the external opening effectually closed also. The fluid has since gradually become absorbed, and there exists now only a fibrous cord along the track of the inguinal canal.

CASE VI. *Right Congenital Inguinal Hernia.* — W. B., aged three, was admitted, under the care of Mr. Folker, on April 1st, 1879. The internal ring easily admitted the index finger. The left ring was closed, and both testes had descended. Operation having been delayed in order to improve the child's general health, was performed on May 10th, under chloroform. The next day, the little fellow wanted to get up; he had no pain, and was only annoyed at the confinement. At night he became feverish, and had some abdominal pain, with retention of urine, requiring the use of the catheter. On May 12th there was no pain nor further retention. On May 17th the discharge was profuse. The instrument was removed, the opening being completely occluded. On June 2d he was allowed to get up; no pad or truss being needed, as there was no tendency whatever to a return of the hernia. He left the infirmary on June 5th, quite well, and has remained so.

CASE VII. *Large Right Inguinal Hernia.* — T. K., aged twenty-six, a potter, was admitted, under my care, on April

28th, 1879. The patient had a large right inguinal hernia, which had existed about two years; and he was suffering also from nodular scrofulous disease in each testicle, the right one being as large as a goose egg. His general health being unsatisfactory, cod-liver oil and iodide of iron were ordered, with Scott's dressing to the testis. On June 7th, his condition being much improved, and the size of the testes diminished, the operation was performed under carbolic spray, chloroform being given. The hernial sac was thick, and very adherent to the surrounding tissues; but invagination was effected without much difficulty, the inguinal canal being open enough to admit two fingers. Next day (June 8th) he was free from pain; no sickness; temperature, 99° Fahr. On June 9th the dressings were changed. The wounds were quite quiet; temperature, 98.4° Fahr. On June 11th he was again dressed; temperature, 99.4° Fahr. On the 14th there was very slight suppuration from each opening; temperature, 98° Fahr. On June 16th the instrument was removed easily; there was free suppuration from both openings. His general condition was good. The bowels acted spontaneously. The patient was restless and fidgety, so that the dressings were disturbed rather frequently. The temperature yesterday was 100° Fahr.; to-day, 99.8° Fahr. On the 19th the upper wound was closed; there was very slight suppuration. A firm cord could be felt along the line of the inguinal canal, which was securely closed. The swelling of the testis was greatly diminished. (Incidentally, this is an interesting fact, and is probably explained by the blood supply being diminished from pressure on the vessels of the spermatic cord.) On July 3d he was allowed to get up and walk, a pad and bandage being applied. The temperature varied, the highest record being 100° Fahr., until June 23d, when it was normal. On July 10th the wounds were firmly closed; there was no impulse on coughing. He was discharged cured. He has reported himself since, keeping quite sound, but wearing for security a light pad-truss.

CASE VIII. *Right Inguinal Oblique Hernia*.—George W., aged eight, was admitted, under the care of Mr. Folker, on June 12th, 1879. The hernia was about the size of a hen's egg, the hernial opening easily admitting the index finger. On June 21st the operation was performed under chloroform. After the operation vomiting occurred, and he complained of some pain, which was relieved by an opiate. On June 23d the dressings were changed. There was no discharge. The patient was rather restless, but slept well. On June 26th the scrotum was red and swollen. There was slight discharge, and rather more pain. On June 30th the instrument was removed. The discharge was profuse, and the scrotum still œdematous. On July 5th (fourteen days from operation) the discharge had ceased; the wounds were rapidly healing; the swelling was subsiding. On July 9th the wounds were healed; no discharge. The swelling was gone. There was no impulse on coughing. On July 16th the patient was quite well, and the wounds quite sound. A few days afterwards the hernia showed a tendency to return *behind* the cord; the anterior part of the inguinal canal remaining firmly closed.

CASE IX. *Congenital Right Inguinal Hernia*.—L. R., aged three, a healthy little fellow, was admitted, under the care of Mr. Folker, on June 24th, 1879. After the usual preliminary preparation, he was operated on June 28th, under chloroform. On the 29th the temperature was 99° Fahr.; on the 30th, 98.4° Fahr. July 1st. He had been very "good" since the operation, not requiring any opiate, nor any special attention. Temperature, 100.2° Fahr. On July 4th castor-oil was given, which acted twice, causing no pain. The discharge was more free. Temperature, 100.2° Fahr. On July 6th, under chloroform, the instrument was removed; the India-rubber covering the point being much more easily managed than the gauze used in the previous cases. Temperature, 100° Fahr. On July 9th the discharge was much less. All swelling and irritation had subsided.

The bowels acted daily. On July 14th there was no discharge. He was allowed to get up. The openings were quite firmly occluded.

CASE X. *Right Inguinal Hernia*. — Wm. J. T., aged nine, was admitted, under the care of Mr. Folker, on July 17th, 1879. No cause was assigned for the rupture, which was first noticed about a year before. It was of the ordinary oblique kind, and about the size of a hen's egg, reaching into the scrotum. On July 19th, after the usual preparation, the operation was performed under chloroform. Much sickness followed, and considerable straining. Temperature, 98.2° Fahr. On July 20th there was no complaint of pain; no sickness. Temperature, 99° Fahr. On July 26th (seventh day) the instrument was removed. There was some discharge from both openings, but less than in some of the previous cases. An enema was ordered, as castor-oil, previously given, had been inoperative. The temperature was 99° Fahr.; it had been on the 25th 99.8° Fahr. On July 28th there was little discharge, and no surrounding irritation. The patient felt "quite well." On July 31st the line of the canal was hard and dense, and appeared most effectually closed. There was no impulse on coughing.

CASE XI. *Left Inguinal Hernia*. — Wm. Jas. D., aged thirteen, was admitted on July 17th, 1879. About two years previously the rupture was occasioned by lifting a very heavy weight, and was now about the size of a hen's egg. On July 22d the operation was performed, after the usual preliminaries, under chloroform. In this case a steel instrument was used. On July 23d there was no sickness, but he complained of some slight pain. Temperature, 99° Fahr. On July 26th the discharge was rather free, and surrounding irritation was more marked than in most cases, — due, possibly, to the employment of a steel instead of a plated instrument, but also in some degree to the fact that the point of the screw pressed rather firmly on the scrotum. It

would have been better, perhaps, if another turn had been made in the operation, so as to place the point beyond the skin of the scrotum. On July 28th the discharge was more profuse. The temperature yesterday was 99.4° Fahr.; to-day, 98.4° Fahr. On

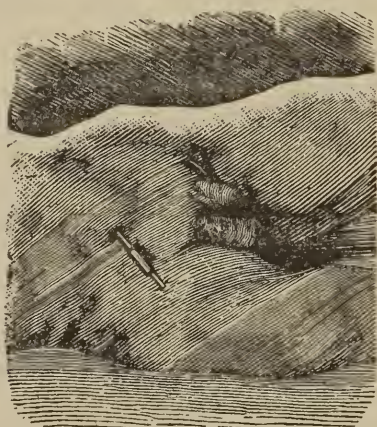


Fig. 62. — From a photograph taken three days after operation.

July 28th the patient was rather feverish. The temperature had risen to 101.4° Fahr. The instrument was removed quite easily, the India-rubber slipping off very readily. On July 31st he was quite comfortable. The discharge was slight. He had no pain. Temperature, 99.4° Fahr. A firm, hard swelling was felt along the spermatic canal, and there was no impulse whatever on coughing.

CASE XII. *Right Oblique Inguinal Hernia*. — John B., aged eleven, was admitted to the Staffordshire Industrial School, under my care, on July 25th, 1879. The cause of the hernia was unknown; but the rupture was first observed about two years before, and was about the size of a small orange. No truss had been worn. On July 26th, after the usual preparation, the operation was performed under chloroform. (Fig. 62.) On July 28th he complained but little of pain, though an irritable subject. There was slight purulent discharge, and some œdema of

the scrotum. Temperature, 100.4° Fahr. There had been no sickness since the operation. He had a rather troublesome cough (which he had had some time); but there was no tendency to any reappearance of the hernia. He was ordered some linctus, to be taken frequently. On July 29th the temperature was 100° Fahr.; on the 30th 98.6° Fahr. On July 31st the line of the inguinal canal was quite hard and firm, the instrument still in. The temperature was normal. On August 4th the instrument was removed. The hernial canal was firmly occluded. He was discharged well on September 27th. He has been working on a farm since, and remains quite well.

CASE XIII. *Right Inguinal Hernia*.—Elizabeth W., aged twenty, a domestic servant, a healthy, strong, young woman, was admitted into the North Staffordshire Infirmary, under the care of Mr. Alcock, on July 15th, 1879. When lifting a heavy weight, she noticed a swelling suddenly appear in the right groin, which, on admission, was found to be a hernia about the size of a hen's egg, which disappeared in the recumbent posture. On July 31st, the operation was performed under ether, No. 2 screw being used. She progressed without any unfavorable symptom. The instrument was removed on August 8th, the opening being firmly plugged. She left the Infirmary on September 18th, quite sound.

CASE XIV. *Right Oblique Inguinal Hernia*.—Mrs. S., married, aged twenty-seven, residing at Hanley, a stout, well-developed, healthy woman, had only one child, ten years previously. She never had any serious illness. She first noticed rupture eight years ago, after falling down some steps. It had gradually increased in size, and latterly became painful. When I saw her on September 23d, 1879, there was a right oblique inguinal hernia, about the size of a duck's egg, and the inguinal ring was quite open. After preliminary preparation, I operated at the patient's

house on October 7th, 1879, Dr. Partington administering chloroform. Lister's antiseptic dressings were used, and the operation was performed under carbolic spray. After the operation, some chloroform-sickness ensued, which soon subsided. — October 8th. She slept little, but had no pain. There was frequent retching. Temperature, 98.5° Fahr.; pulse, 96. — October 9th. She slept well after a dose of morphia. The wound was quiet. Temperature, 98.5° Fahr. She had no pain. — October 10th. She was going on well. The wound was dressed under spray. There was slight serous discharge, and some œdema along the inguinal canal, with induration. She was ordered to have a dose of castor-oil. The daily progress was uninterruptedly good, and she suffered no pain. — October 15th. The wound was dressed, and the instrument removed. There was very little discharge; the track of the instrument was indurated throughout. — October 23d. The antiseptic dressings were removed. The wound was almost healed. Simple dressing and a pad and bandage were applied. — October 26th. The wounds were quite healed. She was allowed to get up. There was no impulse in the inguinal canal on coughing. — November 14th. She had been about ordinary household duties, and felt quite comfortable, and could stoop and move without any pain or discomfort such as she had previously. She wore a pad truss, and has continued well and strong since.

CASE XV. *Right Inguinal Congenital Hernia.* — Frederick J., aged four, was admitted into Children's Ward, North Staffordshire Infirmary, under Mr. Spanton, on August 23d, 1879. He was a healthy, unmanageable child, with a large scrotal hernia of the size of a man's closed fist. The inguinal rings were very wide, and the finger could be passed easily within the abdomen. No truss was of any avail to keep up the rupture. On August 23d, after the usual preliminary treatment, I performed the operation with the screw instrument, under chloroform. Owing

to the great width of the pillars of the hernial ring, I could not satisfactorily secure a hold upon the internal pillar, which was, indeed, so far obliterated that it was formed chiefly by the border of the rectus-sheath. I had some misgiving at the time that the hold I had obtained was not sufficiently secure, and the sequel shows that this was well founded. — August 24th. The patient had during the night removed the lint pad and also the ball from the point of the screw. The latter was not replaced, but the bandage was firmly reapplied. — August 28th. The patient was very restless, although he said he had no pain. The instrument had become twisted somewhat, owing to his constant movement. He took food well. — August 30th. A slight attack of diarrhoea came on. — August 31st. The instrument was removed (eight days after operation), — there being a moderate amount of irritation in its track and slight purulent discharge. The temperature had never risen above 98° Fahr. September 5th. The hernia had descended again, and the inguinal ring was almost as patent as before operation. The child appeared quite well. — September 30th. He was allowed to get up. It was found impossible, even with a firm pad, to keep up the rupture. Feeling convinced that the failure was due to an imperfect hold having been obtained on the internal pillar of the hernial canal, quite as much as to the unruly behavior of the patient, I decided to operate again; and on October 10th, under chloroform, I performed the operation a second time, taking especial care to obtain as firm a hold as possible of both sides of the inguinal canal. This involved taking up the sheath of the rectus; and I found that the adhesion of the subcutaneous tissues to the skin of the scrotum rendered the separation of them more troublesome than usual. But the operation was satisfactorily completed in the ordinary manner. — October 12th. He slept well; had no pain. He was much less restless than after the former operation. Tempera-

ture, 98.6° Fahr. — October 13th. There was some œdema of the scrotum ; no discharge. — October 21st. He progressed well. The highest temperature had been 99.6° Fahr. (on 13th) ; since then normal. There was a considerable amount of local irritation along the course of the instrument, and a moderate purulent discharge. The instrument was removed under chloroform. — October 24th. The wounds were healing rapidly ; the discharge had ceased. This morning, while dressing, the child cried lustily ; but there was no tendency to any descent of the bowel. The canal was occupied by a firm fibrous mass, and completely occluded. — December 8th. He was allowed to get up, wearing a pad-truss ; and on the 19th he was discharged well.

CASE XVI. *Right Oblique Inguinal Hernia.* — Thomas P., aged twenty, glass-cutter, single, was admitted into the North Staffordshire Infirmary, on August 29th, 1879. The rupture was about the size of a hen's egg, of three months' standing caused by jumping. On August 30th, the operation was performed in the usual manner, under chloroform. — September 3d. There was slight discharge from the lower wound. The general condition was good. — September 6th. The instrument was removed ; the ball being imbedded under the skin, owing to the screw being rather too short. — September 10th. The discharge had ceased ; the wounds were nearly healed. There was a firm cord along the inguinal canal, which gave no impulse on coughing. — September 15th. He was allowed to get up. The wounds were quite healed ; the plug firm. — September 22d. He was discharged well. — September 29th. He called to report himself as feeling quite sound, and not needing a truss.

CASE XVII. *Right Congenital Inguinal Hernia.* — Albert C., aged six, was admitted into the Infirmary on September 11th, 1879, under Mr. Alcock. Before admission, the hernia was strangulated, and great difficulty was experienced in its reduction. On admission, a rupture of the size of a small egg was

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present, quite reducible. On September 13th, the operation was performed under chloroform, after the usual preparation. — September 14th. He suffered but little pain, slept well, and seemed comfortable. — September 20th. The instrument was removed under chloroform. — September 24th. The wounds were nearly healed; the discharge was slight. There was some swelling of the scrotum. No impulse was produced on coughing. — October 9th he was allowed to be up. The hernial canal was obliterated, and there was no impulse on coughing. He was discharged cured. The highest temperature in this case was 99° Fahr.

CASE XVIII. *Right Inguinal Congenital Hernia.* — William C., aged five, was admitted into the Infirmary on September 30th, 1879. The child, on admission, did not appear strong. He had a right congenital hernia of the size of a large hen-egg. The pillars of both rings could be clearly defined, and the openings easily admitted one's finger. Cod-liver oil and iodide of iron were ordered for a few days; and on October 11th, after the usual preparation, the operation was performed by Mr. Folker, under chloroform. — October 12th. He slept well; no pain. Temperature, 98.4° Fahr. — October 20th. The instrument was removed. Some difficulty was experienced in taking away the ball from the point of the screw, owing to its being buried in the tissues. Temperature, 100° Fahr. — October 23d. A hard, rather painful enlargement was felt on the right side of the scrotum. There was free purulent discharge. Temperature, 101.4° Fahr. He was ordered to take some bromide of potassium mixture, and have evaporating lotion applied. The swelling gradually subsided; and on October 30th, the temperature was normal. He was allowed to be up on December 7th. The swelling was quite gone; the inguinal canal firmly occluded; no tendency whatever to recurrence of hernia. He wore a pad-truss. — December 11th. He went home quite well.

CASE XIX. *Right Inguinal Hernia*. — Mary F., aged twenty-six, milliner, was admitted under my care on November 14th, 1879. The patient, fairly healthy, but not robust, had been subject to hernia for about seven years, for which no cause could be assigned. It had never been strangulated, but was often painful; and, although a truss to some extent would keep it up, yet it often would come down, and cause inconvenience. As she was engaged to be married, and anxious to have something done to effect a permanent cure, my friend Dr. Orton of Newcastle asked me to see her with a view to operation. There was a right inguinal oblique rupture of the size of a duck's egg; the hernial opening being large, easily admitting the finger. After the usual preparation, I performed my operation on November 17th, under chloroform. An incision was made in the right labium majus. The skin was separated subcutaneously for an extent of about three quarters of an inch in every direction; and the fascia and hernial coverings made to plug the canal in precisely the same manner as already described, the difference being that in this case it was less easy to separate sufficient tissue to form an efficient plug. In introducing the screw, I was careful to obtain as firm a hold as possible at two points in each pillar of the canal, and to bring it up close, inasmuch as there was not the same necessity for avoiding constriction as in the case of men, where the spermatic cord has to be carefully considered. Lister's spray and dressings were employed; but we found that, owing to the position of the wound, it was almost impossible to carry out the system satisfactorily. — November 19th. Since the operation, she had had pain in the epigastrium. Poultices and an opiate gave relief. The dressings were changed. There was no discharge; a slight blush around the wound. Temperature, 99.2° Fahr.; pulse, 84. — November 21st. The dressings were renewed. Serous discharge and inflammation were slight. Temperature, 99° Fahr. She was ordered a dose of castor-oil. —

November 24th. The parts were dressed again under spray. There was slight discharge; the wound gaped a little. Temperature 98.8° Fahr. An enema was given, after which the epigastric pain was relieved. — November 26th. The instrument was removed under chloroform (ninth day); discharge slight, purulent. — December 10th. The discharge had been more abundant, coming from the track of the instrument. She felt quite well. Poultices were applied. — December 14th. There was less discharge; the wound was healing. She had no pain, but some tenderness to touch along the inguinal canal. — December 27th. Simple dressing was applied. The wound was nearly healed; the canal seemed securely closed; no impulse on coughing. — January 1st. She was allowed to get up, wearing a pad-truss. The patient has since married, and has had no tendency to any return of the rupture up to this time (November, 1880).

CASE XX. *Right Inguinal Oblique Hernia*. — Fred. D., aged six, was admitted into the infirmary, under my care, on November 18th, 1879. The patient was healthy, and the rupture was first noticed six months previously. On admission, both testes were down; there was a large oblique inguinal right hernia of the size of a small orange. The tissues were very lax, and the rings large. On November 22d, I operated, under chloroform, in the usual manner, without experiencing any difficulty. At the same time, the prepuce was divided, to relieve phimosis, which existed. — November 23d. He slept well; had very little pain; no sickness, Temperature, 99° Fahr. — November 26th. Considerable inflammatory œdema of the scrotum had appeared. There was very slight discharge from wounds. The bowels acted spontaneously. Temperature, 100° Fahr. — November 29th. The instrument was removed under chloroform. Discharge free; the swelling of the scrotum continued. Temperature, 101° Fahr., indicating the need for removing the

instrument. — December 12th. The wounds were quite healed. The temperature fell to normal after November 29th, and remained so. — December 29th. He was allowed to get up, wearing a pad-truss, which he bore quite well. — On January 8th, 1880, he went home; the inguinal canal being firmly occluded, with no tendency whatever to any return of the rupture.

CASE XXI. *Left Congenital Inguinal Hernia.* — John C., aged seven, was admitted into the Infirmary, under the care of Mr. Folker, on November 11th, 1879. He was rather a delicate-looking boy, in whom the rupture had come very gradually. On admission, there was a left inguinal rupture, which descended to the size of a hen's egg, with very patent ring. — November 15th. The operation was performed by Mr. Folker, after the usual preliminaries, under chloroform. — November 16th. He had had no pain nor vomiting; he was very quiet. Temperature, 99° Fahr. — November 17th. The wounds were dressed; the parts were quiet. Temperature, 99° Fahr. — November 19th. He had a troublesome cough. Slight discharge. He complained of pains in the legs (from lying so still?). Temperature, 98°. — November 24th. The instrument was removed under chloroform. The discharge was rather profuse; but the surrounding irritation was less than in some cases where the screw was removed earlier. Temperature, 100° Fahr. — December 12th. The wounds were quite healed. He wore lint pad and bandage. — December 19th. He was allowed to get up, with a pad-truss. The parts were quite firm, without any tendency to return of the rupture. — December 22d. He went home quite well.

CASE XXII. *Right Inguinal Hernia from Application of Sayre's Jacket.* — Elizabeth M., aged five, was admitted into the Infirmary, under Mr. Folker, on December 18th, 1879. The child was admitted for angular curvature of the spine, and had a Sayre's Jacket applied in the ordinary way. Very shortly after-

wards, she was found to have a right inguinal rupture coming down as large as an egg, and easily reduced. On January 10th, 1880, the hernia was operated upon with the screw instrument, under chloroform.—January 11th. She had an opiate last night, and was quite easy to-day. Temperature, 98.6° Fahr.—January 17th. The instrument was removed easily. There was considerable irritation around the wounds. Temperature, 98.4° Fahr.—January 22d. The wounds were still discharging. There was a good plug of thickened tissue in the hernial canal.—February 2d. Over the track of the screw, a small abscess formed, which broke this morning. *She had a bad cough.* She continued to improve; but, on March 15th, for the first time, there was noticed a tendency to a return of the hernia at the internal ring when she cried or coughed much, but at no other time. She left the Infirmary wearing a pad. The chief point of interest in this case is the unusual cause for the hernia (*see page 28*); and this was probably the reason, moreover, why the operation was not perfectly successful. If it had been deferred until the child's health had improved and her cough relieved, it is quite possible that the result would have been more perfect. But even as it is, a pad sufficiently controls what tendency to bubonocoele exists and will gradually complete the cure, in all probability.

CASE XXIII. *Right Oblique Inguinal Hernia.*—Daniel A., aged twenty-five, miner, was admitted into the Infirmary, under Mr. Alcock, on January 6th, 1880. Four years previously, the rupture was caused by lifting a weight. At first, only a bubonocoele existed, until three weeks before admission, when the hernia descended to the extent of two inches below the external ring and was easily reducible. He had been wearing a truss, but this failed to keep up the bowel. On January 10th, the operation was performed under ether. The tissues were very loose, and invagination was easy. After the operation he had much pain, requiring opiates. Evening temperature, 99.8° Fahr.—

January 12th. The right half of the scrotum was oedematous, and the skin somewhat inflamed. The ball came off the point of the screw, but was not replaced. He complained of considerable pain and thirst. An opiate at night and soda-water were ordered. Temperature, 101° Fahr. — January 14th. The scrotum was much inflamed and swollen. Castor-oil was ordered. Temperature, 101.4° Fahr. — January 16th. The bowels acted after an enema. The swelling and the inflammation of the scrotum were increased; the discharge profuse. Temperature 102.4° Fahr. The instrument was removed. — January 21st. The discharge was still profuse. The inflammation of the scrotum was subsiding. He had but little pain, and felt much better. Temperature, 98.2° Fahr. Some matter formed on the outer and upper part of the scrotum, which was opened on February 1st, and washed out with carbolic-acid lotion. From this time he gradually improved; and on March 1st, the wounds were quite healed. A firm mass of tissue occupied the lower part of the hernial canal; but the hernia could be felt slightly to enter the internal abdominal ring, and then was stopped by the plugged canal. He left the Infirmary on March 15th, wearing a pad-truss. In this case it would appear that an insufficient hold was obtained on the pillars of the internal ring; or it may possibly be that the excessive suppuration which occurred tended to loosen the early adhesion which was set up, and allow the invaginated tissues to slide, as it were, from their first secure position. As it is, the patient is much better for the operation.

For the two following cases I am indebted to Mr. Jabez Thomas, Surgeon to the Swansea Hospital.

CASE XXIV. *Left Congenital Hernia.* — Charles E., aged eleven, was admitted into Swansea Hospital, under Mr. Thomas, on December 26th, 1879. "The operation was carried out in all its details on January 12th, under the carbolic spray, and the whole instruments and wounds covered with a pad of gauze,

secured by a bandage. The patient vomited once during the night, and the following morning complained of pain and tenderness over the lower part of the abdomen; no tympanites. Temperature, A. M., 102° ; P. M., 100.4° . Liquor morphinæ (mx) relieved him, and the next day this had disappeared. — January 14th. Temperature, A. M., 102° ; P. M., 100.4° . As the gauze was saturated with blood and serous oozing, the parts were dressed under spray. Looked well; tender; no redness; a little œdema of scrotum, and orchitis. — January 19th. The temperature gradually went down, until it reached normal on this day. The wound was dressed as before; slight suppuration; induration along canal well marked. Soap and water enema caused good evacuation, the patient feeling no pain or inconvenience. The left testis was still swollen. — January 23d. The screw was removed; there was no suppuration; the wound was dressed as before. There was good induration along the course of the inguinal canal. The bowels acted naturally. — January 26th. The bowels have continued to act daily naturally. — January 28th. The dressings were removed. The wounds were healed. *The canal was occupied by a good firm elongated plug, to which no impulse was imparted on coughing.* — February 12th. He was discharged cured."

CASE XXV. — Mr. Thomas writes: "The second case, in a child nine years and a half old, ran a similar course to the first, with equally good results." . . . "I saw my first case a few days ago, and found the inguinal canal quite obliterated; and there was no impulse imparted to the induration which occupies its sites."

It would be difficult, I think, to adduce stronger testimony than this of the practicability and efficiency of the operation.

In the same journal for March 19, 1881, a modification of the operation is suggested, but Mr. Spanton writes me that he finds "the original plan the best: the screw retained *in situ* causes

less irritation and a better permanent result than a catgut ligature. Some of my earlier cases were performed more than three years ago, and I see them frequently. They remain perfectly sound." The suggestion is to use a hollow spiral to carry a thread, which should be allowed to remain *in situ*. Mr. Spanton, at the above date, says, however:—

"When I had the privilege of giving a demonstration of my operation at the Cork Northern Hospital, during the meeting of the British Medical Association in that city, I showed a screw-needle made on this very principle, but not hollow. It is a very difficult matter to pass a thread through a hollow needle with several curves; I therefore employed a screw such as I ordinarily use for the operation, but having an eye near the point large enough to carry silk or catgut. The plan I then advised was to pass the screw in the ordinary way, and then thread it; and, on withdrawing the screw, to allow the ligature to remain *in situ*, each end of it being secured to a piece of wood or other smooth material, such as glass or porcelain, in order to keep it on the stretch while the parts are thus held in apposition. I have used it in a case of hernia in a boy this week; but my fear is, that there may not be sufficient irritation set up to cause the invaginated tissue to become agglutinated. But we shall see. Hitherto, I have been so well satisfied with the results after using the screw itself, that I have been unwilling to adopt the alternative plan, which is, after all, similar in effect to Mr. John Wood's operation by ligature."

ANTISEPTIC METHODS.

Antiseptic Ligature of Neck of Sac.—In the *Edinburgh Medical Journal* for December, 1880, Thomas Annandale, Regius Professor of Clinical Surgery in the University of Edinburgh, published the following:—

It is scarcely necessary to remark that operative treatment

for the obliteration or removal of the sac, with the hope of causing the radical cure of hernia, is no new proceeding.

The various methods from time to time suggested and practised for this purpose do not now possess the confidence of surgeons—(1) because the risk of such operations is not slight; (2) because the results obtained are rarely satisfactory.

Owing to the employment of catgut as a subcutaneous ligature or suture, and the introduction of the Listerian antiseptic treatment of wounds, attention has, within the last few years, again been directed to operative procedures on the hernial sac; and since Mr. Lister, in his address to the British Medical Association at Plymouth, in August, 1871, related his experience of two most interesting cases which he had treated with these aids, many patients have been operated upon according to his principles.

Dr. Isidor Israelsohn has recently published his most interesting dissertation on this subject, and in it he has collected seventy-one cases of the radical operation for hernia performed with antiseptic precautions by various surgeons. My house-surgeon, Dr. Waters, has kindly analyzed the list of these cases, and I learn from him that sixty-six of these operations were successful, the result of one was not given, and four patients died. It further appears that, of the sixty-six, fifty-eight remained free from return of the hernia at varying intervals after the operation, and in eight the hernia returned sooner or later, but in some of these cases only to a slight extent.

As far as I know, four methods have been employed with the aid of Listerian antiseptics.

- (1.) Ligature of the neck of the sac alone.
- (2.) Ligature of the neck of the sac, with invagination of the ligatured sac into the abdominal opening.
- (3.) Ligature of the neck of the sac, and excision of the sac below the ligature.

(4.) Ligature of the neck of the sac, with excision of the sac, and stitching together the margins of the abdominal opening.

Having used all these methods, I have no hesitation, from my experience, in giving preference to the fourth plan.

The operation, then, which I practise, is to expose the neck and upper portion of the sac by a fine incision, to make a small opening into the sac, to carefully return the contents, and, in the case of adherent omentum or intestine, to ligature and divide adhesions, to separate the sac from its attachments to surrounding textures, to draw down the sac and apply a catgut ligature around its neck as high up as possible, to cut away the sac immediately below the ligature, and then to stitch together with a continuous catgut suture the margins of the abdominal opening, the stump of the ligatured neck, and the surrounding cellular tissue. The whole operation and the after treatment are performed under strict Listerian principles.

I will now refer to the classes of cases in which the operation may be used.

(1.) In cases of strangulated hernia :

Jan., 1872, I operated upon Mrs. M., æt. 70, for strangulated femoral hernia. On opening the sac a knuckle of congested gut was found, and a large piece of omentum, the latter being firmly adherent to the sac. Having divided the stricture, I ligatured the omentum with catgut, cut it across, and returned the intestine and ligatured stump of omentum into the abdomen. I then separated the sac from the surrounding textures, drew it down, and having applied a catgut ligature around its neck, cut away the sac and adherent omentum. The result pleased me so much that since then it has been my practice, in all cases of strangulated hernia in which the gut was in a proper state to be returned, and in which a distinct sac existed, to adopt this proceeding ; but I have, in addition, stitched the margins of the abdominal opening together. In illustration I relate the following case :—

Miss L., æt. 32. She had suffered from an irreducible femoral hernia for three years, and on the morning of the day I visited her, she was seized with symptoms of strangulation shortly after straining herself in lifting some heavy books. The usual operation for strangulated hernia was performed, and on opening the sac it was found to contain a large knuckle of gut and a portion of adherent omentum. Having divided the stricture and ligatured and cut across the omentum, the gut was returned, the neck of the sac ligatured, the sac and adherent omentum cut away, and the stump of the ligatured sac carefully stitched to Poupart's ligament and to the surrounding tissues. She is able to go about with perfect comfort, but wears a light truss as a matter of precaution.

(2.) In permanently irreducible hernia.

The operation advocated in this paper is perhaps of more value in this class of case than in any other, and I offer a few cases in illustration.

CASE 1. — Mrs. C., æt. 50, May 24, 1880, suffering from a large irreducible femoral hernia the size of an infant's head. A swelling was first noticed in the region of the hernia five years before her admission, and until eighteen months ago was reducible. Since then it has been irreducible, and during the last few months has given her so much inconvenience that she required to lie almost constantly on her back. One week after her admission the operation already described was performed, and as a large mass of omentum was adherent to the sac it was ligatured and cut away. She was dismissed cured and wearing a light truss on the 14th of June.

I am no advocate for operative interference in cases of *reducible* hernia, unless the condition is irrelievable by the application of a truss or other means, and is giving rise to serious inconvenience. When operative treatment is required in these cases, I am inclined to advise the adoption of the proceeding of which this paper treats.

This proceeding has certainly the one important advantage that the surgeon sees what he is doing, and I have not found that the free exposure and handling of the parts is attended with any special risk. Mr. Charles Steele, of Bristol, deserves the credit, as far as I can ascertain, of having been the first to treat a reducible hernia on the antiseptic principles.

Czerny's "Radical Cure." — As a further contribution to the antiseptic method of operating upon hernia, the following paper by Dr. H. Braun, Professor and Assistant Physician at the Surgical Clinic at Heidelberg, is extracted from the *Berlin klin. Wochenschr.* No. 4, 1881 : —

While the repeated publication, during the last few years, of radical operations for the cure of hernia, has arrived only at establishing the harmlessness of such operations, the time has now come for the communication of the final results. This has already been done in isolated instances by Mass and Socin — for the purpose of deciding whether, and to what extent, the expectations excited by these various novel operative methods have been realized.

The following communication, which is partly intended as a contribution to the literature of the radical operations for hernia, but partly and especially destined to aid in judging of the final results, is restricted to the consideration of nineteen operations in various forms of hernia, which were performed on sixteen patients in the Surgical Clinic at Heidelberg, under strictly enforced antiseptic precautions. The histories of the five patients first operated on were reported three years ago by Dr. Czerny in his contribution to operative surgery; those of the eleven who were operated on later are given below.

CASE I. — H. Hirsch, of Heidelberg, two and one-half years of age, admitted October 21st, 1877, on account of an incarcerated left inguinal hernia which had been first noticed eight days after his birth, but had only been partially relieved by a

truss. The symptoms of strangulation had made their appearance on the day previous to his admission. After enemata of large quantities of fluids and attempts at reduction by the taxis, while in the bath and during narcosis, had all been attended by no success, my colleague, Dr. Kaiser, on October 21st, performed external herniotomy, whereupon the reposition of the intestines was easily accomplished. The orifice of the hernial sac was closed by means of two sutures of well-disinfected silk. We did not deem it advisable to ligate the sac, as its loosening was not sufficiently practicable on account of its thin texture. The inguinal canal was so considerably narrowed by the suture that it hardly admitted the introduction of the tip of the little finger. A drainage-tube was placed in the cavity of the wound, and the integument over it was united by means of the button suture. During the first few days after the operation the scrotum swelled and appeared inflamed, and until October 27th there was an elevated temperature; patient had a stool for the first time on October 22d, after a small enema of water. Suppuration from the wound was scanty, and the treatment was aseptic throughout. A small abscess in the scrotum was opened on October 30th, and on November 5th, at the eighth change of the dressings, the healing of the wound and abscess was found to be complete, so that on the 10th the child was discharged. The orifice of the hernial sac seemed to be completely closed, and the sac itself had shrivelled to a thin string; no infiltration could be discovered in the scrotum.

After being discharged, the child wore a truss for three weeks, after which it was left off entirely. The intestine, however, never appeared through the inguinal canal again, and the cure was complete. At an examination in September, 1879, as well as on a subsequent one in August, 1880, the inguinal canal was found passable for the tip of the little finger, but even in coughing no noticeable impulse was felt and no other hernia had formed at any other place.

CASE II. — A. Wolf, aged six and a half months, of Heidelberg, had acquired in the twentieth week after birth a left inguinal hernia, which could be held back easily by means of a truss. According to the statement of the physician in attendance, who brought the child to the Clinic, April 18th, 1878, on account of symptoms of incarceration — vomiting, constipation, and hardening of the hernia — the taxis had been successfully performed four weeks previously, on the appearance of similar symptoms.

Upon the admission of the little patient, the vas deferens could be plainly distinguished, and immediately before it could be felt a solid swelling, the thickness of the little finger, which could positively not be diminished in size, even during narcosis. As the symptoms of incarceration remained unchanged, on the evening of April 18th I performed herniotomy, exposing a hernial sac of extraordinary thickness and filled with serous fluid; its inner surface was reddened, but it contained no intestinal loop. We had evidently to deal with an inflamed hernial sac, which had caused the symptoms of strangulation. The sac was partly ligated at its neck with catgut, as its complete loosening from the vas deferens could not be effected, a drain was put into the wound and Lister's dressing applied. During the following night the bowels moved twice, but the vomiting did not again occur. On April 19th, however, strong convulsions of the extremities appeared, which recurred, always with increasing violence during the night and on the 20th. The wound remained entirely aseptic, scarcely any secretion forming. On April 20th, at 5.30 p.m., the patient died in very violent general convulsions. At the autopsy the wound was found to be agglutinated, with no trace of suppuration; no traces of peritonitis were discovered and the brain showed no pathological alteration.

CASE III. — E. Bidlingmaier, aged forty-three, of Hockenheim, was admitted into the hospital on May 7th, 1878, suffering from

a strangulated right femoral hernia,* and on the same day herniotomy was performed; after resection of a piece of intestine (?) the loop was easily returned to the abdominal cavity. The neck of the hernial sac was ligated with thick silk. The wound healed without interruption, and on June 17th the patient was discharged, wearing a truss. The time required for complete recovery of the hernia itself could not be accurately ascertained, as the patient did not show himself for some time. On examination in September, 1879, it was noticed that a small hernia had again appeared. In June, 1880, the condition was unchanged and the hernia had not increased in size.

CASE IV. — M. Schultheiss, aged forty-five, of Handschuchsheim, had worn a truss, as well as he could recollect, since his fifteenth year, on account of a right inguinal hernia. In the fall of 1877, in lifting a heavy load, he brought on a left rupture also, which of late had been gaining in proportions. He was admitted on June 7th, 1878, as on account of the large size of the two ruptures they could no longer be retained by means of trusses. The scrotum measured on the right side, from the external inguinal opening, 23 ctm.; on the left side, 24 ctm.; the circumference of the scrotum at its base was 39 ctm. Prof. Czerny performed the radical operation. The right hernial sac was ligated with silk, its orifice closed with five button-sutures of carbolized silk; the sac was opened, its cavity washed out with a five per cent carbol-solution, a drainage tube was placed in the scrotum, and the integument united by means of button-sutures. After this, the orifice of the sac on the left side was closed with four silk sutures, and the remainder of the operation conducted as in the right side. During the few days following the operation, an ice-bag was kept upon the Lister dressing, the patient was kept upon a liquid diet, and morphia was administered several times subcutaneously.

* The history of this case was published *in extenso* by Prof. Czerny in the *Berlin klin. Wochenschr.* No. 38, 1880.

On June 9th the dressing was changed for the first time, the bands having given way, as the restless patient would not remain quiet for a single moment. On the right side the upper part of the wound was somewhat swollen and reddened, while on the left side the wound was entirely without reaction; some sutures were removed at this dressing. On June 11th the swelling and congestion had extended along the crest of the right ilium; slight suppuration appeared along the stitches of this side, while, as in the preceding case, the wound of the left side showed no reaction; all but three of the sutures were removed. On June 12th, there were for the first time abundant stools. On the 13th the swelling on the crest of the ilium was smaller, but on the other hand, the right half of the scrotum was more swollen and the testicle itself exceedingly sensitive to touch. On the left side, the last stitches were removed, the wound was completely healed and in the future remained closed. During the next few days the suppuration on the right side continued. From June 23d a dressing of oiled wadding was applied on account of the appearance of a carbolic eczema.

On June 26th and for several following days, some pieces of the now gangrenous hernial sac came away, two of the sutures at the orifice of the sac appearing in the suppuration. The swelling of the surrounding tissues yielded gradually. The temperature was always normal except on the seventh and eighth days, when it rose to 38.5° and 38.3° C. By the 16th of July the wound had closed completely. On the 26th the patient could leave, entirely cured, wearing a truss and a suspensory bandage. On the right side a slight impulse could be felt on coughing, but on the left nothing could be noticed. It was impossible to ascertain accurately the length of time required for a complete cure in this case, as the patient wore the truss very irregularly. At a subsequent examination on Nov. 10th, 1879, a hernia scrotalis was found to have developed on

the right side; the orifice was large enough to give passage to the intestine. On the left side the hernia descended to the root of the penis and was about the size of a hen's egg; the orifice admitted the passage of a finger-tip. Both hernias could be easily reduced, and retained by means of a truss. During the fall of 1880 the orifices of the hernial sacs had become more dilated and the rupture had increased in size, but could be entirely retained by the truss, which, however, the patient wore very irregularly.

CASE V. — M. Marx, aged forty-five years, of Schriesheim, has for two years had a left inguinal hernia, which, until about three months ago, was about the size of a hen's egg, when it suddenly became larger. On his admission, July 30th, 1878, the tumor was 21 ctm. in length, measuring at the base 38 ctm., while its largest circumference was 42 ctm. Reduction of the rupture was difficult, and to retain it completely was no less so. Walking or working caused such severe pain within the hernia that the patient urgently asked that the operation might be performed, which was done by Prof. Czerny on August 2d, 1878, in the presence of Prof. Billroth. The sac, which was considerably thickened, was incised and, after the intestine it contained had been shoved back into the peritoneal cavity, was tied up above with a thick silk thread, its orifice closed with four similar silk sutures, and the wound, into which several sutures were placed, was washed out with a five per cent carbol-solution, drainage applied, and the whole covered with antiseptic gauze.

The day after the operation it became necessary to change the dressings, as they were saturated with blood, when a slight swelling was noticed upon the scrotum. The temperature, which had remained normal up to August 4th, rose suddenly to 39.4° C., and 40.2° C. On August 5th the suppuration had an odor of decomposition, and the coverings (?) had turned

black ; the temperature remained the same. The sutures were all removed, the Lister dressings left off and replaced by applications of lead-water ; on account of a diarrhœa, which had set in, tincture of opium was given. The scrotum remained swollen. This condition remained unaltered until August 11th, the secretions still smelling badly, the only improvement being a slightly less swollen condition of the scrotum ; the temperature remained constantly above 38° C. On August 11th a gangrenous spot appeared on the tunica dartos, which gradually increased in size. On August 30th, A.M., paralysis of the right side was noticed by the point of the tongue, when extended, deviating to that side ; aphasia soon followed, and on the following day the right facial nerve was also implicated. The bladder and bowels were evacuated into the bed, involuntarily. On the scrotum the gangrene had extended, necessitating repeated incisions, each of which gave exit to foul-smelling pus.

Symptoms of peritonitis did not appear, either now or afterward. On August 17th clonic convulsions appeared in the left extremities ; the aphasia and paralysis continued unchanged ; the pupils, however, were, and remained equal, and the intellect was unaffected. The gangrene was circumscribed, and as the necrotic portions of tissue fell off successively, sound granulations appeared. On August 18th the patient asked for some wine ; he had become generally brighter, but complained of headache. His condition remained about the same for several days ; the wound and its surroundings improved slowly after the gangrenous portions had sloughed away and the swelling of the scrotum diminished. The paralysis continued the same. On August 27th acute vesicular breathing could be heard in both lungs ; crepitating râles and bronchial expiration could be heard behind the upper left lobe and the sense of suffocation increased gradually. The fever continued until September 2d, thirty-one days after the operation, when death occurred.

The autopsy, made on the following day, revealed endocarditis with verrucous excrescences upon the mitral valve, embolism of the arteria fossæ Silvii sinistra (left middle cerebral) and embolic softenings in the left hemisphere, in the spleen, pleura, and right lung. There was pleuritis on both sides, and lympho-sarcoma of the retroperineal lymphatic glands. The inner wall of the peritoneum showed a protrusion at the site of the internal inguinal ring; in the bottom of the funnel lay the silk ligature of the neck of the hernial sac surrounded by fresh cicatricial tissue, while further on were found two "heeled out" sutures at the entrance of the sac. No traces of peritonitis were seen. Death, in this case, was the consequence of the gangrene of the scrotum and the incidental suppuration which caused embolism in divers organs, though the lympho-sarcoma of the mesenteric glands pointed to a prolonged illness.

CASE VI. — V. Müller, aged forty-one years, from Ilversheim, came to the Clinic on account of an incarcerated right inguinal hernia, which dated from two days before. The rupture had occurred suddenly, four or five years previously, while lifting a heavy load, but had always been easily reducible. On admission, the size of the hernia, which was expanded to its utmost, was 42 cm. from the external inguinal ring to the point of the scrotum. The circumference of the scrotum at its base was 46 cm., and in the middle 42 cm. There had been no evacuation of the bowels for two days, and vomiting was almost constant. As baths, ice-bags, wrapping up the hernial protrusion in elastic dressings, and taxis while the patient was anæsthetized, were of no avail in reducing the rupture, I performed herniotomy, and in connection with it the radical operation. After the longitudinal incision over the greatest convexity of the tumor was made, a number of large veins had to be doubly ligated and excised. In no place could the hernial sac be made out, but the muscular fibre of the prolapsed intestine could be recognized.

A peritoneal protrusion was found in the upper part of the rupture, which, however, did not form a hernial sac, but was drawn down by the cœcum and the end of the ileum ; then the prolapsed intestines could be recognized on drawing them forward after completely loosening them.

The processus vermiformis, which was closely adherent to the testicle, without any peritoneal covering, had to be completely loosened from its intergrowth with the cellular tissue, in order to make a reposition of the intestines practicable. The cœcum and the ileum had to be similarly peeled out of the surrounding tissues ; more than thirty silk ligatures were necessary to stop the hemorrhage. After the intestines were completely freed from their adhesions, and their contents emptied by rubbing down, their reposition could still not be accomplished, and only after the orifice of the hernial sac had been somewhat dilated upward and outward, could they be pushed back into the abdominal cavity. The neck of the hernial sac was then so narrowed by five button-sutures that only the tip of the little finger could be introduced. The wound was then washed out with a five per cent carbol-solution, two drainage tubes were placed in position and the skin sewed together over them with button-sutures. At noon, after the operation, flatus escaped, and on the next day the first stool was passed. Vomiting occurred once, perhaps in consequence of the prolonged narcosis by chloroform.

At the first change of dressings, on August 16th, a large quantity of bloody, serous liquid ran out ; the scrotum was not swollen, but there was a slight tumefaction immediately above the right ligamentum Poupartii ; there was also dulness, which remained unaltered for several days. The right lumbar region became somewhat sensitive to pressure on account of the drainage tubes — one of which extended far upward into the abdominal cavity — which were washed out at every change of the dressing ;

there was scarcely any suppuration. The subjective condition was good, notwithstanding the high temperature (39° C.). On August 21st, considerable swelling of the scrotum was noticed, which necessitated an incision. Later on, some gangrenous pieces of connective tissue appeared at the external wound and were removed. Stools occurred daily, until September 1st, when diarrhœa set in. On September 7th, a large quantity of pus was evacuated with the fæces, and smaller quantities often appeared up to September 20th. The rise of temperature had persisted until September 2d. The pulse, which never was above 92, went down to 88, then to 82. On September 18th the patient got up, wearing a truss, and was discharged on October 4th fully recovered. In coughing, no impulse could be felt at the seat of operation, but the beginning of an inguinal hernia appeared on the left side, which did not exist at the time the patient was admitted.

This case is interesting in many respects. In the first place we had to deal with a coalescent non-reducible hernia which contained cœcum, processus vermiformis, and the lower portion of the ileum, without a hernial sac. The smaller peritoneal protrusion, which was situated in the upper part of the rupture and toward the abdominal cavity, could not be termed a hernial sac; at the utmost it could only have served for the admission of other portions of the intestines.

There was here, probably, some congenital intergrowth of the processus vermiformis with the testicle; if this is not admitted it is hard to understand how this intestinal appendix could have been completely drawn out of its peritoneal covering. Perhaps the cœcum and the lower part of the ileum were drawn out of their peritoneal envelop by this same traction. Furthermore, in this case there was extensive suppuration, which led to intestinal perforation. It may be admitted that the chances for a radical cure were increased because union could be obtained between

extensive wound-surfaces ; at any rate, Müller remained entirely cured for more than one year, as was shown by repeated examinations.

On April 14th, 1879, a cicatrized cord, the thickness of a lead-pencil, could be felt along the right vas deferens. The operation-wound was flattened and movable. In coughing, increased impulse could be felt, but no intestine was forced out, and the inguinal ring admitted the finger. The left hernia had not increased in size. The patient had all this time worn a truss and was employed at hard labor. On September 14th, 1879, although the condition of the right side had remained perfectly satisfactory, an intestinal loop, the size of a small fist, appeared on the left side upon coughing. Thanks to a double truss, Müller could still work hard, and appeared fat and healthy. July 14th, 1880, the opening of the hernial sac on the right side allowed the passage of two fingers, and, on coughing, a hernia about the size of an apple pressed into the scrotum ; the left inguinal hernia had also increased in size, and, beside this, an umbilical hernia had made its appearance.

CASE VII. — K. Scharf, aged seventy-nine, was admitted August 30th, 1878, with a left strangulated inguinal hernia. According to the patient, the rupture had occurred three days before, during a violent fit of coughing. On August 28th, Dr. Feldbausch, who saw the patient at the poor-house of this town, ascertained the existence of a non-reducible hernia the size of a small apple. The patient had vomited twice ; after an enema, flatus and a small quantity of fæces passed off. On August 29th the tumor was said to be somewhat softer, but during the following night, vomiting of greenish — not fæcal — matter occurred three times.

On August 30th, the broken-down old woman, who was failing rapidly, was brought to the surgical department in consequence of several enemata not having produced an evacuation. Upon

admission, I found that on the right side the inguinal canal was large enough to admit the tip of a finger, and on the left side, at the corresponding location, there was a hard lump the size of a walnut, exceedingly sensitive, which could not be reduced in size by any manipulation whatever. As the incarceration had already lasted two days, I abandoned the long-continued attempts at taxis and performed herniotomy. The incision was made under antiseptic precautions, and some bleeding vessels were taken up with fine silk. Proceeding further, we reached a thick layer of subperitoneal fat and afterwards the moderately thickened hernial sac, which contained a small quantity of liquid matter. The constriction was incised from within outward and a small, strangulated, dark-blue portion of the intestine, about the size of a hazelnut, was pushed back into the abdominal cavity, after some adhesions on its posterior surface had been loosened. The hernial sac, once freed, was cut off directly beneath the ligature, which I had made far up. The opening of the rupture was closed with a thick silk suture by perforating the columns of the inguinal ring, together with the peritoneum. When the drainage tubes were placed, the wound was closed and a Lister dressing applied.

There is very little to relate of the history of the wound. There was very little suppuration; the dressing was changed twice only — the first time to remove the drainage-tube and a few sutures, on the fourth day; and the second time, to remove the last sutures on the sixth day. The vomiting had ceased immediately after the operation, but there was no stool until the sixth day, and they were regular afterwards. September 13th, the patient got up for the first time, and was sent back to the poor-house on the 18th. She was obliged to take to her bed several times during the few following weeks, and died of pneumonia about the middle of November.

At the autopsy I ascertained that no trace of hernia was

present. The peritoneum showed positively no depression at the internal inguinal opening, on which could be seen the encapsulated ligature which had been used to close the ring; towards this point radiated corrugations appeared, which had become adherent; these, and also the silk thread, were covered with endothelium.

CASE VIII. — G. Wunsch, aged fifty-two, came to the surgical clinic on June 15th, 1878, on account of a fracture of the thigh. The broken bone united slowly, and only after the removal of several fragments of bone; not until the end of September was recovery complete. In addition to the fracture, the patient had a left inguinal hernia reaching down to the knee, but which seemed to cause comparatively little trouble to the stupid patient. The size of the tumor could be diminished little by little, under pressure, but it was not entirely reducible. By the application of elastic bandages for several weeks, the recumbent posture, a fluid diet combined with massage of the scrotum and continued efforts at reduction, the hernia slowly decreased in size, and finally complete reposition could be effected. During this treatment at the hospital, a small rupture appeared on the right side. After the patient could get up and walk around, the application of a double truss would retain the right, but not the left inguinal hernia; the truss and the suspensory bandage gave the patient so much pain that he could not endure them for any length of time. The orifice of the right hernial sac would easily admit two fingers, while that of the left would admit only one. The right hernia measured 27.8 ctm. from the outer inguinal ring to the lowest point of the scrotum, while the same measurement of the left gave 28.5 ctm.; the circumference was 34 ctm. The impossibility of keeping the hernia reduced, and the inability of the patient to perform his customary labor, induced Prof. Czerny to perform the radical operation on January 11th, 1879.

A tegumentary incision was made — about 10 ctm. in length — crossing the ligamentum Poupartii, and the hernial sac laid bare and opened; it contained the sigmoid flexure and omentum. The hernia was reduced only by the simultaneous reduction of a portion of the sac. The orifice of the latter was then closed with the continued suture, and the whole replaced in the abdominal cavity. The inguinal canal was closed with five silk sutures. The non-reducible portion of the hernial sac (in which were found two localized indurations, one the size of the palm of the hand, the other about the size of a dollar) was excised. The excised portion was cap-shaped, and had a diverticulum 3 ctm. long, 1.5 ctm. broad. The circumference was 33, and the depth 8.10 ctm. The wound was irrigated with a five per cent. carbolic solution, drainage established, sutures applied, and the whole covered with a Lister dressing. It was necessary to change the dressings the next evening, as they had become displaced. On the fourteenth and sixteenth days some sutures were removed with each dressing. The scrotum became somewhat swollen, and a moist carbolic-eczema appeared at several points. On account of the latter, Lister's dressing was discontinued, and fomentations of a two per cent solution of acetate of alum were substituted. February 7th the eruption had disappeared, and the swelling of the scrotum had subsided; on February 22d the patient got up for the first time, and on the 28th he was dismissed with the following *status*: The scrotum measured from the external inguinal ring 18 ctm. in length, with a circumference at the root of the penis of 24 ctm. The left epididymis was somewhat thickened, and in the left scrotal sac a firm fibrous mass was discovered. On standing, a protrusion the size of a pigeon's egg appeared at the left inguinal ring, and could be enlarged to double this size by coughing; the inguinal ring was passable for the tip of the finger. The right hernia was about the size of an apple. A double truss now retained both herniæ without causing any pain.

Wunsch did not return again to the surgical clinic, but on account of his continued inability to work he was admitted on May 18th, 1879, to the asylum of Sinsheim.

According to a note which I have received from the medical director of that asylum, Dr. Langsdorf, there is now a reducible hernia of the right side about the size of an apple, the opening of the sac measuring 3 ctm. in diameter; on the left side, an irreducible hernia the size of the two fists has protruded through an opening measuring 2 ctm. The length of the hernia from the external inguinal ring is on the right side 15, on the left 25 ctm.; the circumference of the scrotum at its base is 37 ctm.

CASE IX. — W. Hollweck, ten months of age, was admitted January 9th, 1879, on account of a very large, double, reducible inguinal hernia. The ruptures were noticed soon after the birth of the child, but nothing had been done to secure relief. They had increased in volume so that they measured from the hernial opening 10 ctm. on the left side, and on the right 9 ctm.; the circumference was 25 ctm. One more attempt was made to keep the hernia in place by a well-fitting double truss, but while it was difficult to reduce the herniæ in this constantly crying child, it was altogether impossible to retain them after reduction; they protruded immediately after each reposition, and all attempts at cure by this means were abandoned. The radical operation was performed on both sides at one sitting, January 24th, 1879, by Prof. Czerny.

Under antiseptic precautions an incision, 4–5 ctm. in length, was made over the left hernial tumor, and after exposure of the sac — which was very thin — the hernia was reduced.

The hernial opening was closed by means of two catgut sutures, the sac was ligated and then divided, whereupon it was discovered that the ligation had not been complete, and that through its posterior portion an entrance could be effected into the abdominal cavity. Two drainage tubes were inserted, and

the wound was closed with five silk sutures. The same method was adopted on the right side, except that the hernial opening was closed with two silk sutures; the now opened hernial sac was pushed aside, a drainage-tube was inserted, and the wound was united by silk sutures.

On account of the tenderness of the skin, a dressing of thymol gauze and salicyl-wadding was used. Temperature at night was 37.9° C. (100° F.).

For a short while the dressings had to be changed at least once daily — often several times a day — on account of their being soiled by the fæces and urine. Slight swelling appeared in the left inguinal region, but not in the right. On January 28th, as the wound of the right side had ceased suppurating, the drainage-tube was removed from this side; the tube on the left side was allowed to remain, as there was still some secretion. The course of recovery was entirely aseptic until February 2d, when the coverings were found to be discolored, without, however, any rise of temperature being observed. The swelling upon the left side subsided gradually, and on February 13th there was only a slight, superficial wound upon this side, while the right side had been firmly healed for several days. A pushing down of the viscera could be felt on both sides when the child cried, but no protrusion appeared through either inguinal canal. The patient was dismissed on February 19th, wearing a double truss.

At a later examination, on September 19th, 1879, it appeared that the cure upon the right side had been permanent, but upon the left side there was a hernia the size of a small apple. The mother, who had taken off the truss soon after the operation, was advised to reapply it, and to keep it on night and day. For three weeks this advice was carried out, and when the child was examined again, July 15, 1880, both herniæ were completely cured; no protrusion of the viscera appeared in the

inguinal canal of either side, and only a very slight impulse was felt.

CASE X. — G. B., aged forty-one, was admitted, May 16, 1879, with a rupture of the linea alba. He had been under the care of a physician since January of the same year, on account of a feeling of pressure and a steadily increasing pain in the region of the stomach. The tumor appeared directly in the median line, about 2 ctm. above the navel, was white, elastic, sensitive upon pressure, and could be partially reduced, allowing the tip of the little finger to be introduced through the opening in the abdominal wall.

On May 17th, after a thorough evacuation of the bowels, the operation was performed by Prof. Czerny. A transverse incision, about 2 ctm. in length, laid bare the tumor, which was as large as a hazelnut. After dividing the skin and subcutaneous cellular tissue, a dense mass of fat, enclosed in a thick membrane of connective tissue, was exposed, and could be traced by a pedicle through the opening in the linea alba. This small subserous lipoma was drawn out, its pedicle ligated at the lowest possible point with thick catgut, and cut off directly beneath the ligature; it happened that a small portion of the peritoneum was also ligated, but no intestine was included. The stump of the pedicle was loosened from its adhesions to the hernia, and was returned to the abdominal cavity. The hernia itself was retained by the introduction of two catgut sutures, from above downward; these were then cut short, and the wound was closed by silk sutures, — a small drainage-tube having been placed in the middle of the wound. In the evening the patient complained of pain in the region of the stomach, which, however, was relieved by morphia (0.015) and the application of an ice-bladder. The wound healed without suppuration, and on the sixth day the dressings were removed entirely. The pain in the region of the stomach reappeared once — on the day after

the operation, — and then disappeared altogether. The patient was dismissed June 1st, wearing an elastic bandage with a pad. The patient, after dismissal, wrote several times, and also came once himself; he reported no return of the pain in the gastric region.

CASE XI. — K. Kirchner, aged thirty-five, came to the surgical ward on August 18th, 1880. For several days small evacuations, consisting of very hard fæces, had been secured only by means of enemata, and, according to the report of his attending physicians, there had been complete constipation since August 10th. Injections of large quantities of warm water, three doses of calomel, each consisting of 0.5, with 1.0 of jalap, ol. ricini with ol. tiglii, and finally mercurius vivus (August 16th), did not afford any relief to the patient; tinct. opii simpl., which was given on account of the severe colic, was no more successful. On admission, the patient's appearance showed a depressed general condition, the tongue was dry, the pulse small and accelerated, temperature 37.8° C., the abdomen very large and so tender to the touch, especially above the umbilicus, that an exact examination was impossible. After the administration of tinct. opii, and repeated enemata of large quantities of liquids (which, however, were dejected free from faecal matter), the patient felt better. The abdominal pain again returned with violence, and the meteorism persisted, even after several evacuations had occurred, on August 19th. On August 20th, a swelling the size of a hazelnut, extremely painful on pressure, which had been noticed upon the previous day, and had been taken for a hernia epigastrica, could be plainly distinguished.

At noon of the same day, his condition remaining the same, I performed herniotomy under antiseptis. Division of the integument exposed to view a small adipose tumor, which could be plainly distinguished from its surroundings, and appeared inflamed. After it had been completely separated from con-

nections with other tissues and drawn out from the margins of the hernial opening, — the latter being situated in the linea alba — it was ligated as low down as possible and excised. The pedicle was returned to the abdominal cavity, the opening in the aponeurosis of the abdominal muscles closed by means of a catgut suture, and the wound united by four silk sutures. After the operation the patient felt greatly relieved, and the tenderness above the umbilicus had to a great extent disappeared; the abdomen was soft, had become smaller, and was not sensitive to pressure. On the next day there were several evacuations. On August 22d, the sutures were removed from the wound, which had apparently healed by first intention; diarrhœa occurred repeatedly upon the 22d, and on the 24th hard scybalæ were passed, to which adhered small black granules of quicksilver. After this, all the intestinal discharges were washed and carefully examined for quicksilver, and on the 25th, 90 grm., partly oxidized, were found, and again on the 26th, 80 grm. At this time, too, a small quantity of pus was discharged from the upper part of the wound, which until now had remained closed; on the 28th, several furuncles appeared in this neighborhood, which, after the separation of a few gangrenous sloughs, healed, together with the operation wound.

Until August 29th, all the fæces discharged contained small granules of quicksilver, and the entire amount collected was 180 grm. No salivation occurred on account of the presence in the body of this large quantity of metallic mercury; on the contrary, as is stated above, the tongue was entirely dry in the beginning, and only gradually became somewhat moist. The thermometer showed a morning temperature of 37.6° C. to 38° C. from the 18th to the 22d; after this date the temperature was normal. On September 10th, the patient, who now had one daily evacuation of the bowels, left the bed, and on September 19th was discharged. About the middle of December,

1880, K. was known to be perfectly well ; the cicatrix was not tender, and no colic or derangements of digestion had occurred in the mean time.

The last two cases show how small herniæ of the linea alba, even if they do not contain segments of the stomach or intestine, may give rise to serious disturbances. In the first case, the hernia adiposa, as large as a hazelnut, had drawn out through the hernial opening in the abdominal wall a small peritoneal diverticulum, while in the other patient nothing of this kind could be observed. In the second case, we might be doubtful as to the condition present, if there had not been symptoms of peritonitis in connection with the hernia epigastrica ; but the extreme tenderness of the hernia, its appearance at the operation, the subjective relief after herniotomy and the sudden disappearance of the meteorism and abdominal tenderness made it most probable that the peritonitis was directly dependent upon the hernia.

The occurrence of these small herniæ in the linea alba or in its vicinity, between the umbilicus and the xyphoid process, is certainly not a rare one. Sometimes, however, these herniæ adiposæ are not looked upon as the cause of the patient's sufferings ; sometimes, even, they are overlooked, if a careful examination of this special region is not made ; I have seen three other cases in our surgical clinic, who complained of pain in the gastric region, and on whom these small, somewhat tender herniæ could be demonstrated. It is certainly advisable in all cases where grave symptoms are caused by these ruptures to excise them, and close the hernial opening, after having loosened and returned the pedicle ; even if a small portion of the peritoneum should also be excised, the operation, performed under antiseptic precautions, will nevertheless be practically without danger, and rapid union of the wound may be secured.

In order to facilitate a review of all the material from which this report is made up for the final conclusions, I shall now add

the principle features of the five cases operated on by Prof. Czerny,* and taken from the complete reports of these cases previously published :—

CASE XII. (*loc. cit.*, p. 15). — J. Ehret, one and a half years of age, was operated on, July 26th, 1877, on account of a very large double inguinal hernia, which could not be retained by trusses. On the right side the hernial opening was closed by four button-sutures of carbolized silk, the sac was partially ligated, the wound washed out with a five per cent. carbolsolution, and drainage established. The left hernial opening was also closed with three silk sutures, the neck of the sac ligated and drained. A subcutaneous phlegmon developed on the right side, and was incised; from the opening thus made the sutures and the ligature employed in the operation protruded. Union by primary intention took place on the left side. On August 25th, the boy, apparently cured, was dismissed without the application of a truss.

In the early part of September a small abscess appeared on the left cicatrix, and was opened; the hernial opening on this side was very small, impulse could be plainly felt, but no protrusion could be discovered. On the right side a knuckle of intestine protruded when the child cried, but returned spontaneously during rest. September 25th, the right hernia was still enlarged, and after each reposition of the intestine the sac was found to be occupied by a cord, — supposed to be the vermiform appendix, — which had been seen in the hernia at the time of the operation. Since this last examination the patient has worn a truss constantly. At a late examination, on September 21st, 1879, the hernial opening of the left side could scarcely be found, while that of the right side was large enough to admit the tip of the little finger. When the child cried or screamed, the inguinal regions of both sides swelled out somewhat, but no

* Czerny, V., Beiträge zur operativen Chirurgie. Stuttgart, 1878.

intestine entered the inguinal canals. The father's statement that at times there was a protrusion from the right canal could not be verified at the examination, though the little one cried constantly,—possibly the father had noticed the testicle, which was strongly retracted, and mistook it for a hernia. On September 1st, 1880, the left inguinal canal was too small to admit the tip of the little finger; and although an impulse could be felt when the patient coughed, there was no intestinal protrusion. The right canal admitted the little finger, and coughing caused the protrusion of a hernia as large as a pigeon's egg, which, however, was easily reducible, and could be retained by a truss. This rupture had enlarged gradually for the past six weeks, during which time the patient had been suffering from the whooping-cough. After reposition of the intestinal loop, the cord—above mentioned as probably being the vermiform appendix—was felt lying along the inguinal canal. Since spring he had worn a single (for the right side) instead of a double truss; the latter was again recommended on account of the severe coughing.

CASE XIII. (*loc. cit.*, pp. 19 and 38).—Fr. Rachel, aged seventy years, was operated on, August 2d, 1877, for a very large right inguinal hernia (there was also a hernia of the left side as large as an apple). The hernial opening was closed with silk button-sutures, the sac was ligated high up with silk thread, washed out with a five per cent. carbol-solution, and drained. Complete union by first intention occurred, and on September 12th the patient was discharged, wearing a double truss. In November, the impulse on the right side was stronger than normal, and a hernia incipiens appeared to be forming. Rachel did not present himself again, but his son said that the hernia had not enlarged, nor had it caused any trouble to the patient up to the time of his death, which occurred in January, 1879.

CASE XIV. (*loc. cit.*, pp. 22 and 38).—Martin Wallbauer, aged

sixty-three years, was operated on, August 8th, 1877, on account of an incarcerated right inguinal hernia. The hernial opening was closed with three strong silk button sutures, the hernial sac was ligated with a strong silk thread, its cavity washed out with sponges which had been immersed in a five per cent. carbolic solution, and drainage established. The wound healed in six days without suppuration, the patient left his bed on the 24th, and was dismissed on the 28th; standing or straining caused no protrusion. In November, 1877, the patient's condition was the same as at the time of his discharge. On September 13th, 1879, the patient presented himself again for examination, at which it was discovered that there was a hernial opening on the right side, admitting the finger, and from it protruded a tumor the size of a pigeon's egg. He had worn his truss irregularly, but according to his statement, the recovery had been complete for a year. On July 15th, 1880, a hernia interstitialis was found on the right side; the hernial opening appeared tense, but the hernia itself had not increased in size. During this time another hernial opening had formed, into which a finger could enter.

CASE XV. (*loc. cit.*, pp. 22 and 38). — George Kinzinger, aged forty-eight, was operated on, June 14th, 1877, for a fecal fistula in the hernial sac. After direct union of the intestinal wound with three catgut sutures, — above which were applied a second row of five button-sutures, — and after returning the loop to the abdominal cavity, the hernial opening was closed with a corset-suture of thick catgut, crossed fourfold, the hernial sac was ligated, also with catgut, its cavity washed out with five per cent. carbolic water, and drainage established. On the sixteenth day after the operation the wound had completely healed, the patient left his bed on June 9th, and about the middle of July was dismissed. During August and September his condition remained the same as at the time of his discharge. During 1878

a small hernia again appeared, about the size of a goose egg. On July 15th, 1880, it had not increased in size, the hernial opening admitted the finger, and felt very tense. The patient appeared healthy, notwithstanding very hard labor at his trade, — that of carpenter, — all kinds of food agreeing with him, and he never suffered from constipation or intestinal pains.

CASE XVI. (*loc. cit.*, pp. 32 and 38). — The radical operation was performed on Conrad Kraus, aged forty, on July 2d, 1877; also for a fecal fistula in the hernial sac. In this case, also, the intestinal wound was closed by seven catgut button-sutures, over which was applied a second row consisting of seven sutures; the hernial opening was then united by means of the catgut corset-suture, and the hernial sac was partly ligated at its neck, as the incision into the sac reached too high up to be accessible for ligation. On August 7th the patient was dismissed, cured.

In November, 1877, the impulse of the intestine in the inguinal region was found to be somewhat greater than normal, but there was no protrusion. During the year 1878 a hernia again appeared, and on September 14th, 1879, it was as large as a goose egg, and remained of this size until July 18th, 1880, when the viscera protruded, together with the external portion of the inguinal canal, but did not descend into the scrotum, and was reducible. The truss has been worn ever since, the patient looks well, can take any kind of food without difficulty, and has regular evacuations of the bowels.

Summary. — In summing up the main features of the above enumerated cases, we find the nineteen radical operations were performed on sixteen patients, ten times for single, three times for double inguinal hernia, and two times for hernia of an adipose tumor in the linea alba. The indications for the radical operation were incarceration of the hernia in five cases (I., II., III., VI., VII., XIV.), the inability to retain the hernia by means of trusses in five cases (IV., V., IX., XII., XIII.), irreducible

hernia on account of adhesions, in two cases (VIII., XII.), and fæcal fistulæ in the hernial sac in two cases (XV., XVI.).

Concerning the methods of operating, we may divide the cases (with the exception of the two ending fatally), one as a result of pyæmia (V.), the other from contusions independent of the operation (II.), as follows:—

Complete ligation of the neck of the sac, together with suture of the hernial opening, was made in nine cases of inguinal hernia—(IV., V. (double), VII. (left), XIV., XV., XVI.), and in the two cases of hernia of adipose lipomata in the linea alba (XI.). The hernial sac in these cases was washed out with a five per cent. carbol-solution and drained; it was extirpated only once, and then because it was small and had been loosened from all its connections during the operation.

Healing of the wound occurred six times without suppuration, within six to ten days (IV. (left), VII., X., XIV., XII. (left), XIII.), four times after suppuration for fourteen, sixteen, thirty-six, and thirty-nine days (XI., XV., IV. (right), once death ensued V.). All patients were dismissed wearing a truss.

In six adults with inguinal hernia, local *recidives* occurred several months after, and at the point of operation (IV. (double), XIII., XV., XVI.); in one case only was the *recidive* found after the lapse of a year, but it was small and could be easily retained by a truss. The patients with hernia of lipomata in the linea alba (X., XI.) were completely cured.

In the adult female (VII.) who died about six weeks after the operation, of pneumonia, no trace of a hernial opening and no eversion of the peritoneum could be discovered at the autopsy. In the case of the child (XIII. left), the cure remained permanent, as shown by a recent examination three years after the operation.

Partial ligation of the sac, in addition to suture of the hernial opening, was practised on two children (IX. left, XII. right), on

account of its extreme thinness; recovery was complete in twenty-four and thirty days. In one child (IX.) a local *recidive*, developed several months after the operation, was cured by wearing a truss and remained so (as was demonstrated recently) ten months after its application. In another child (XII.) a *recidive* also occurred, and was retained by a truss for a whole year, but recently reappeared again in consequence of whooping-cough.

The hernial opening alone was closed in four cases; in one adult (VI.), because there was no hernial sac, in another (VIII.), because the sac had to be partly pushed back into the abdominal cavity to enable the reduction of the hernia; then, in two children (I., IX. right), on account of its thin, friable condition. Healing was complete in fourteen, eighteen, twenty-seven, and fifty-one days (I., IX., VIII., VI.).

In one adult who had an exceedingly large hernia (VIII.), a *recidive* occurred several weeks after the operation, while in the other (VI.) the cure remained for one year, after which time a partial *recidive* appeared. Besides, in both of these patients the hernia developed on the side which had not been operated on — in one an umbilical hernia, also. Both children were permanently cured after recovery from the operation, as was demonstrated in the one (I.) after thirty-four months, and in the other after nineteen months. The neck of the hernial sac alone was ligated in one adult (III.), the wound healing in twenty-one days with little ulceration; but here, also, a *recidive* occurred, which remained slight for seven months.

As to the ages of the patients operated on, the following results — independent of the method of operating adopted in each individual case — may be given from the foregoing statements: One death occurred in thirteen radical operations upon twelve adult patients; in the two cases of hernia adiposa liniae albæ, the cure was permanent, and in the others it lasted from several

months to two years, after which time *recidives* appeared either locally or directly above the site of operation; twice a hernia of the other side, and in one case an umbilical hernia in addition. In all these cases, however, the local *recidives* remained small and could easily be retained by a truss, even in those cases where the operation had been performed for the relief of very large herniæ.

Out of six radical operations in four children, death occurred in one case independent of the operation. In three cases, which, on account of the size of the hernia, would not have recovered spontaneously, with one exception the cure remained permanent from the moment of the operation, and was demonstrated after nineteen, thirty-four, and thirty-seven months (IX. right; I., XII. left); in two, local *recidives* developed, one of which, however (IX. left), could be retained by means of a truss, and had remained cured when it was last examined, ten months later.

Conclusions. — We may be encouraged by these statistics to perform the operation for the radical cure of hernia, in adults, under the following circumstances: Where the hernia is strangulated; — as, by the radical operation, danger to life is not increased; for very large non-reducible herniæ which render the patient unfit for work, or which, on account of their size, cause intolerable difficulties; and finally, for fæcal fistulæ in the hernial sac. These latter various conditions — the relief of which was formerly only very exceptionally attempted — are included in the list of operations, on account of the confidence in the harmlessness of such interference under antiseptic precautions. Even if, in such cases, no *radical* cure be obtained, these herniæ or their *recidives* may be retained by a truss. In cases of small uncomplicated herniæ, the operation is to be rejected, as a permanent cure cannot be promised with certainty, and the patient would not be able to dispense with the truss. Without restriction, the radical operation is to be recommended in small children, for strangu-

lated and very large herniæ which are difficult of reduction, or which cannot be cured by wearing a truss, as, according to our observations, the final result would be even more favorable than in adults, if the antiseptic dressings could be applied with the same exactness as in the latter. The dangers of the operation will be much diminished by frequent change of the dressings — although this makes the after-treatment extremely troublesome and requires much time — and by the ligation of the closed hernial sac. In older children, antiseptis may be carried out with tolerable certainty, and favorable results will be obtained by the radical operation in these cases.

Which method of operation is to be preferred, will, naturally enough, not be decided by the results obtained in these few cases. As long as it remains doubtful whether the constriction of the hernial opening or the ligation of the neck of the sac is the most essential to a cure, it will be the more rational to combine both procedures where it can be done. There will be plenty of cases in which, necessarily, only the one or the other method can be selected, and these will help to solve the question, which method is to be considered the more important. After the application of the suture, the constriction of the hernial opening could be demonstrated for weeks; it could also be shown that the contraction continued and the columns became generally more tense. Even if in some patients an enlargement of the opening occurs, it has never attained, in our cases, the size that it had before the operation. If, in addition, the hernial sac is ligated and obliterated on a level with the internal hernial opening, the peritoneum will certainly be less easily everted through such a narrow opening, than if it is drawn over a wide hernial opening. It is, however, a doubtful question to me, whether according to our experience, the success of the operation may be promoted by producing an ulceration in the hernial sac, as has been asserted by other operators. According to the

above record, it is desirable to secure union as early as possible ; for the cure remained permanent in several instances, or at least *recidives* did not occur so soon, in those cases where the wound healed by first intention. This was especially remarkable in the case of two children (IX., XII.), in one of which the wound suppurated for a long time on the one side, while on the other it had healed *prima intentione*.

For comparison with other methods of operation, the author would beg leave to make the following conclusions of his own. It is true the most of the cases here detailed were serious ones, but still the total number of real, permanent successes is only *three* out of the *nineteen* operations. The total number of deaths was *three* ; of partial cures, *three* ; of cures for one year, *four* ; and of failures, *six*. In nearly all the cases, active suppuration was a consequence of the operation, and the average length of treatment was thirty-three days ; so that it does not seem that the Antiseptic Method of Ligation is, after all, so simple and successful as some have claimed it to be.

CHAPTER XI.

ARTIFICIAL ANUS AND WOUNDS OF THE INTESTINES.

ARTIFICIAL ANUS.

ARTIFICIAL anus is applied either to the opening made in the skin by nature, in consequence of the mortification of a strangulated intestine, or to the opening made artificially by the surgeon, when the bowel has become strangulated and gangrenous.

There is also an artificial anus made by the surgeon's knife in the infant, when it has had the misfortune to be born into this world with imperforate rectum, or in the adult for cancerous or other permanent obstructions of the rectum. This is so far foreign to our present study, however, that, although highly interesting, it will demand only the briefest mention.

The place chosen for the incision varies. Littre, in 1720, chose the left iliac region, opening the sigmoid flexure through the peritoneum, but the operation was not performed until 1776. Callisen, on the other hand, chose the left lumbar region, attempting to open the descending colon without injuring the peritoneum.

Littre made an incision about two to three inches in length, from the level of the anterior superior iliac spine and parallel to Poupart's ligament. The peritoneum was divided, and search made in the left iliac fossa for the sigmoid flexure. It often happens that in the infant this flexure is in the right fossa instead of in the left, as normally. When found, it is to be stitched to the external incision that was made.

The superiority that is claimed for Callisen's method depends upon the fact that the left colon is devoid of peritoneum in the posterior third of its circumference, especially when distended. Another advantage is that the anus is made in the posterior, instead of in the anterior, aspect of the abdomen. There is, however, no certain indication of the limits of the extent of the peritoneum upon the colon, and it has been found by statistics that the operation does not possess its much-vaunted superiority of not injuring the peritoneum.

Amussat proposed a valuable modification of Callisen's method. In 1839 he operated on a case by making an incision, about two fingers' breadth above the crest of the ilium, beginning at the external border of the sacro-lumbalis and longissimus dorsi, and extending outward about five fingers' breadth. The muscular layers are divided first transversely and then vertically in order to make a crucial incision, and thus better expose the intestines. A crucial incision is also made in the colon. After the intestine has been evacuated, and, if necessary, washed with injections of warm water, it is drawn forward, and fastened to the skin by four interrupted sutures.

In newly-born children the presence of the kidney singularly inconveniences the surgeon, especially if it be at all abnormal in its position. It must be borne in mind that the colon is on the external side of the kidney, so that, in order to find the former, the kidney must be pushed to the inner side and to the rear.

As to the practical results of the formation of an artificial anus, whether in the infant or in the adult, it must be confessed that the operation is a very dangerous one, and, at the very best, can secure to the patient only a miserable and loathsome existence. It is a very doubtful question whether to submit an adult to such an operation, or whether to leave nature to form an artificial opening by a slough, and then take the chances of recovery; but in the case of an infant, probably the best course

is to leave nature to herself, and let her have her way without operative interference.

After this brief diversion, we will return to the division of the subject that more especially interests us at the present moment, viz., the artificial anus which is the result of an intestinal strangulation. This variety occurs most frequently in the inguinal, scrotal, and femoral regions, and, as a rule, involves only the small intestine. Whatever faecal discharge takes place is involuntary and continuous, owing to the entire absence of a sphincter.

Artificial anus differs according to the extent of the opening that is formed in the intestine. When only a small ulcerated opening exists, which does not however interfere with the continuity of the intestine, but which still allows some of its contents to escape, we speak of it as a faecal fistula. The perforation is usually at the fundus of the strangulated knuckle of intestine, that is, at the point most distant from the mouth of the sac; it often heals spontaneously. There may be a single fistulous orifice or there may be several openings. When, however, as is usually the case, there is only a partial sloughing of the intestines, we find, on account of the different powers of resistance which the coats of the bowel possess, that a groove is formed on the serous, but an ulceration on the mucous surface; a re-entrant fold is thus made which obstructs the passage of faecal matter from the upper to the lower part of the intestine. Very rarely, the adjacent serous walls become adherent from long-continued pressure, ulceration eats through them, and the continuity of the canal is restored.

On the other hand, sloughing of the entire bowel takes place at the mouth of the sac, continuity is destroyed, and faeculent matter escapes from the opening. The two ends of the intestine lie parallel for a greater or less extent, and the partition wall or spur-like portion of the two adjacent walls of intestine, called

the "éperon" (the full importance of which was first pointed out by Dupuytren), may act as a valve and hinder the passage of feces. Hence the proximal orifice of the intestine becomes dilated, while the distal portion of the bowel, having ceased to transmit feces, becomes smaller. This is an almost constant feature of "anus contre nature." When the external opening is large, there is also a tendency for the mucous lining to become everted and form a prolapsing tumor. If the slough has been in a knuckle of intestine, the external opening will present an appearance not unlike a double-barrelled gun, the dividing septum being the "éperon" just mentioned. A more rare form, mentioned by Malgaigne, is where there are two points of division, the anus opening by two orifices near each other, but separated by a bridge of skin. If, however, the slough has been in the parietes of a straight portion of intestine, the external orifice will be single and of much simpler treatment.

It is important to notice that, although the bowel gives way within the peritoneal cavity, the feces do not become extravasated into this, but escape externally. This is because the bowel at this point loses its peristaltic action, and the neighboring parts become inflamed. The lymph which is thrown out consolidates these parts both to one another, and to the parietal peritoneum, so as to inclose completely the gangrenous portion of the intestine. It is therefore worthy of the surgeon's attention not to disturb the adhesions which may have formed between the sides of the opening and the neck of the sac.

The treatment of artificial anus that has thus formed is twofold,—to destroy the "éperon," and then to close the external opening. A permanent opening, however, often remains in spite of all remedial efforts. The margins of the opening may then be sustained by a circle of ivory or steel, padded around its circumference with horse-hair and covered with oiled silk, or else a receptacle may be worn and kept in place by an elastic band

or truss, until inconvenience warns the patient of the pressing need to empty it.

Schmalkalden's Operation. — Schmalkalden, in 1798, was the first who thought of destroying the "éperon." He passed a stylet, protected on the point with wax, into the inferior end. After piercing the "éperon" in this way, he divided it with a probe-pointed bistoury. To enlarge the opening, he divided it still further with scissors, but a complete cure did not result for twelve years. Physick, of Philadelphia, in 1809, passed a thread through the base of the "éperon," and formed a ligature which he allowed to remain *in situ* for a week. But these operations are dangerous, since the limits of adherence may be passed, and an opening made into the peritoneum.

Dupuytren's Operation. — In 1813, Dupuytren attempted Schmalkalden's operation, but, perceiving its dangers, he invented an enterotome, like a pair of forceps, with separable

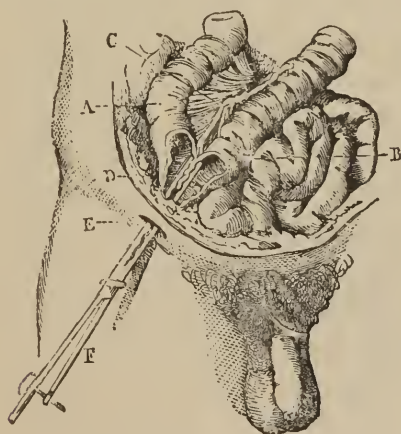


FIG. 63. — Dupuytren's Method and Enterotome.

blades; the female blade has upon one of its sides an undulating groove admitting the sharp edge of the male blade. The blades are approximated by a thumb-screw. The patient being placed in the position for the operation for strangulated hernia, the

septum is found compressed between the blades of the instrument. The two ends of the intestine are thus made parallel for a great extent, and are made to adhere by the compression. Usually the instrument becomes loose by the eighth day, leaving a dry eschar in place of the "éperon." When this has fallen off, there is left only a hard ridge at both sides of the opening.

Dupuytren's method has been modified by Liotard, Blandin, and Gross, to obtain an increased loss of substance; by Nélaton, Richet, Panas, and J. Mason Warren, to secure an easier application; while Langier lined the jaws with caustic to hasten their action. The instrument sometimes causes severe pain, and Jobert cites a case where all the symptoms of strangulation were produced by too tight compression. The method is not in all cases trustworthy, and may be extremely dangerous to life.

The fistula, or external opening in the integument, was formerly treated by cauterization with sulphate of copper or nitrate of silver, by compression, or by the quill suture. The mucous membrane which has become adherent to the skin, so long as it is present, offers an insurmountable obstacle to the coaptation of the walls. Its removal, as I have just said, was formerly attempted upon general principles. Velpeau freshened the parts adjacent to the intestine, and fastened them together by a suture not touching the intestine. By this method a conical cavity was formed, with the apex pointing towards the intestine. Malgaigne separates the intestine from its external adherences, taking care not to injure the peritoneum. The two lips of the intestine are then united by a ligature, so as to bring their external surfaces back to back; the freshened integument is united by a twisted suture. The essential feature in the operation is to separate the intestines from their attachments and to fold the two lips inward.

Enterotomy. — When the surgeon is convinced that the bowel has become gangrenous from strangulation, or will speedily be-

come gangrenous if the inflammatory processes are not checked, he should seriously consider the operation of enterotomy. This operation was first performed by Nélaton upon a patient of Trousseau's for intestinal obstruction. The parietes over the hernial protrusion where the gangrene is suspected are carefully divided, layer by layer, until we come to the most deeply-seated aponeurosis. Proceeding slowly, tying all vessels that may be severed, and sponging carefully, the surgeon cuts down to the peritoneum. This is raised by the small forceps and divided. Then, with the greatest precautions, a silver thread is carried by a curved hollow needle through the intestine and abdominal walls, until enough sutures are in to fix everywhere the gangrenous patch of intestine to the opening that has been made.

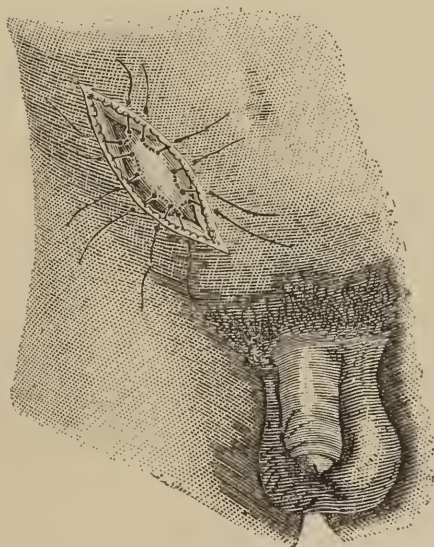


FIG. 64. — Artificial Anus.

The gangrenous patch is then excised, and the patient given all possible chances for recovery. The inconveniences which the patient suffers from the constant flow of faecal matter from the permanent artificial anus thus formed have already been spoken of.

WOUNDS OF THE INTESTINES.

In herniæ, these wounds are seen under two different conditions. First, where simple incisions are made by the cutting instruments of an operator. If these be small, the muscular fibres speedily contract so as to approximate the several ends of the mucous membrane; or if the incisions be larger, they may become rapidly agglutinated together by the lymph which is effused, or else the omentum may act as a plug.

Secondly, where the ring has become constricted, and an ulcer has eaten its way through the intestinal walls. The loss of substance has here been so great that we can hardly hope for a closure without operative procedures. If the opening be longitudinal, and in the direction of the length of the intestines, it may be closed by suture, either the interrupted or the continuous. If the opening be transverse, so that there is complete section, the ends may be united by *invagination*, by *direct union* or by *circular ligature*.

Invagination.—In this method, Randohr passed the superior end of the intestine into the inferior, and kept them in apposition by a moderately tight suture, fastening the ends of the

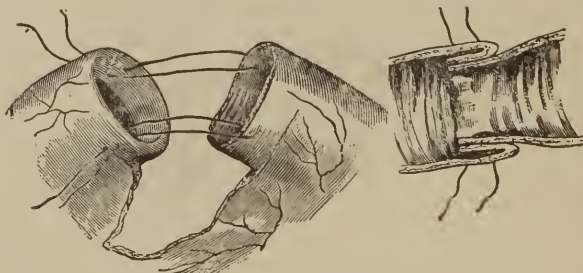


FIG. 65. — Jobert's Method.

suture to the abdominal opening. A single suture is not sufficient. Not only, therefore, has the number of sutures been multiplied, but to make contact more complete the intestine has

been surrounded by a cylinder of prepared card-board or some other unyielding material. Jobert invaginates the intestine and places the serous membrane back to back by first turning the end of the inferior portion inwards before passing the superior end into it.

If the operation be successful, there remains in the inferior end a valve formed by the invagination of the superior end, which contracts the intestine at this point.

Direct Union. — In this operation Raybard has obtained the best results with an interrupted suture. By this method we get an annular constriction; by Jobert's method this constriction is less, but still the formation of a valve makes the latter operation less practicable.

Demans caused direct union by joining the ends with three silver bands, but the presence of such foreign bodies is very objectionable, and is enough to condemn the operation at once.

Circular Ligature. — This is the operation proposed by Bécларd, and was the one adopted by Amussat. The two ends of the intestine, being invaginated into each other, are tied and bound together by a strong band. The parts of the intestine which project beyond the ligature are then cut off with scissors. The two parts of the intestine are thus placed together by their serous surfaces, and the inflammation set up by the ligature causes adhesion. Experiments upon animals have shown that no contraction or constriction results from this operation.

The peritoneal inflammation that may arise, and is likely to arise, from all these wounds or operations, is most successfully treated upon the general principles laid down upon pages 136 and 139 of this volume. Maisonneuve's method of applying ice to the abdomen, as described on page 367, is a very excellent one, and one to be highly commended for practice.

CHAPTER XII.

TRUSSES.

I AM more and more convinced that so important a matter as the proper fitting of a truss has been most terribly overlooked by the medical and surgical profession, and that it should receive more careful and personal attention at their hands. Who in our profession if called to adjust a fractured limb would think of referring his patient to the care of the mere mechanic who may make splints or to the dealer who may vend them, and feel that he had done all that was necessary and right, or that could be expected of him? If no surgeon would think of excusing such criminal conduct in the case of a fracture, which will heal with the most limited amount of surgical supervision, why should it be considered unprofessional to adjust the truss which may have to be worn for years or even for a lifetime, and which if improperly fitted may endanger life far more than protect it? Has not this very important matter been left altogether too long—to our shame be it said—in the control of the manufacturer and the vendor?

I feel confident that I do not draw an exaggerated picture when I say that many a patient when he has asked where or how to get a truss has been told by his medical adviser to “go to Mr. —, druggist, who has them for sale, for as I was coming by his store this morning I saw some fine ones there made by a celebrated maker, I at this moment forget who, but you

can easily find them, for the leather covering is stamped all over with bright gilt letters. I know you will get a good fit there, for Mr. — used to be a cooper, and of course he is used to fitting any body or thing that needs hooping."

Many are the patients that call upon me wearing barbarous appliances, that I certainly would not think of putting upon a brute animal. Let me give one instance. Last winter a poor deluded man came to me wearing a contrivance with four rollers similar to those used on parlour skates. These were applied as a pad to a spring, as stiff and hard as the hoop upon an oaken cask, and the whole was adjusted by heavy straps of stout leather around the body, and having the usual perineal attachment. It pressed so hard that I have often wondered how it was possible that the circulation could act in the large blood-vessels of the lower limb. More than all, it was a very imperfect fit. The swollen and excoriated skin that these implements of torture produce in order, as the dealers say, to produce a *radical* cure will, I think, if my previous arguments have not been sufficient, show why I object to the term as applied to an exact and scientific surgical operation. The agony these poor sufferers endure is only helped along by the extreme delicacy which many of them feel to confess that they are afflicted with a disease, which for purposes of selfish and sordid gain the dealers in trusses often call an immoral disease. Immoral indeed! Would that half the ills of mortals were as free from taint and immorality!

It will readily be understood that in this general condemnation I do not condemn those dealers in these articles who are known to be proper men with honest principles, and who endeavour to fit a truss as the physician may direct. To such men, generally to be found, I should have no hesitation in recommending patients for a proper instrument (Fig. 66).

A properly fitting truss should combine lightness, strength,

and elasticity, so that it can be worn with grace and ease by the patient, and retain his hernia always within the proper place. The steel should be the finest, and as elastic as the mainspring of a watch (Fig. 67). Such a spring can be worn with ease, and is at the same time capable of exerting sufficient force to retain the hernia. A truss like this is now easily obtained from any of our first-class instrument makers, and no others should ever be recommended to be used. Such makers' firms are Codman and

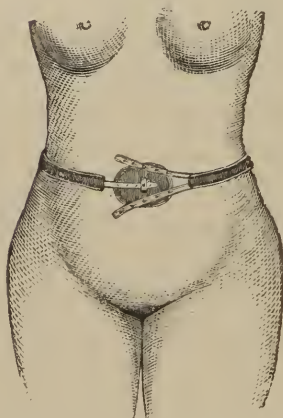


FIG. 66.—Proper position for Umbilical Truss.

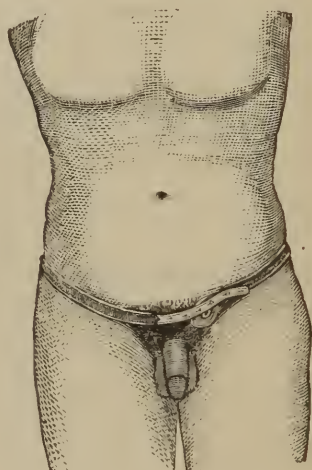


FIG. 67.—Proper position for Truss in Inguinal Hernia.

Shurtleff, of Boston; Tiemann and Co., of New York; Milliken, of London; and Charriere, of Paris. Their styles are numerous, but for effective service the truss should be as plain and as little ornamented as possible. Instruments like these will usually not disappoint us in performing all that is recommended for them, and of course the patient is not endangered by the truss slipping or giving way should he jump or make any sudden movement of the body. It would be well if the patient could always have an extra one at hand, especially in

travelling, so that he may be forearmed in case of any possible emergency.

For a few practical hints upon trusses, their various patterns, and their application, I refer to a paper written for this work by my friend Dr. Benj. S. Codman, of the firm of Codman and Shurtleff, and a gentleman whose experience in this matter we all highly value, from the fact that he has received a regular medical and surgical education, and has spent nearly a lifetime in the proper adjustment of trusses.

“Human ingenuity has ever been taxed to its uttermost to invent a truss, supporter, or appliance, comfortably to restrain and hold this uncomfortable protuberance of the abdominal viscera.

“In the great world’s Exposition in Paris in 1867, in the ‘Surgical Department,’ was to be seen a collection, both ‘ancient and modern,’ of these appliances, which served well to mark the improvement that has been made in their manufacture. Yet we must still look forward, as perfection has not yet been attained, and until it has, we must continue to use the best attainable substitute.

“Which is the best truss? Year after year the cry has been raised, ‘I have found it;’ and a new patent truss has been launched forth, with the promise of meeting every want, and being capable of curing the most obstinate cases of Hernia; only too soon, alas, to disappoint this large class of suffering humanity with its utter failure, and only to see their fond hopes dashed to the ground.

“Trusses are a necessity, and the surgeon should study to meet the want, and thoroughly to understand the anatomy of Hernia, so that he can recommend the most suitable instrument, and the proper person to make the application if he is unable to attend to it personally.

“The best truss is the one best adapted to the case; and when

we say that, we mean that age, sex, and condition are to be considered.

“Is it proper to apply a truss to a very young infant with congenital Hernia? Yes; and the sooner the better, provided it is skilfully done, as the rings contract if properly supported, and the bowels enlarge, so as not to easily force through the inguinal or femoral openings (Fig. 68).

“Trusses for infancy and childhood should be light, springy, and delicate. Children wearing napkins should have the pad constructed of black ebony or ivory, for the following reasons: such pads never change their form; they are more durable, as a soft chamois-covered pad becomes wet with urine, and fœtid,

FIG. 68.



Spiral Spring Pad.

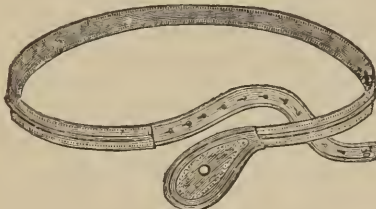
and falls to pieces in a few weeks; and, better than all, the hard pad holds better, is smooth and less irritable, and in many cases will permanently close the rings, and obviate the necessity of a second truss. But to do this the case will require careful watching on the part of both doctor and parents. If parents think a hard-pad is too hard, it may be safe to allow them to place beneath the pad a few layers of an old soft linen handkerchief, which can be changed as circumstances require.

“The surgeon may direct to whom to go and the kind of truss best adapted to the case; but after all, so much depends on the right application and nice adaptation that no one should be patronized or allowed to apply trusses but the most experienced; and if he has made this affliction a life study, and has had

the advantage of a medical and surgical education, so much the better for the patient.

"The cuts in this work illustrate only a few of the many kinds of trusses, all of which have had their day as 'patent trusses,' but are now common property and subserve a general good purpose. (Fig. 69.)

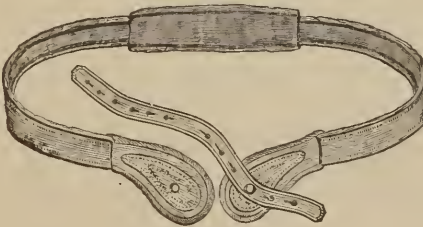
FIG. 69.



Single French Style or Long Pad.

"The French style of truss is a popular truss. It has a light elastic spring and a soft stuffed pad. It affords gentle but firm support to the hernial rings and the lateral muscles, and for persons of either sex advanced in life, or of delicate health, it serves an admirable purpose. It is strongly recommended for

FIG. 70.



Double French Style.

wear after the operation by injection until the parts become firmly united. (Fig. 70.)

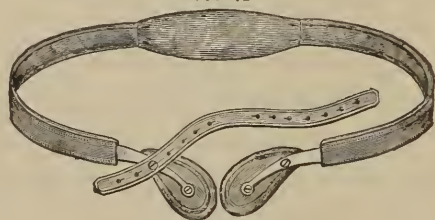
"The Ratchet truss is emphatically the working man's truss, for its construction, strength of spring, and its adaptability. It is the truss generally sold to the country druggist, because it

meets more wants than any other, and because of its easy applicability. Discretion ought always to be used.

“Take the case of a porter with a bad Scrotal Hernia, who has to shoulder a Saratoga trunk and carry it to the fourth story of a mammoth hotel. He must have a truss that will meet every demand of his case. The same is true of an express-man, ever handling heavy boxes and goods. (Fig. 71.)

“The Ball and Socket truss has been for many years a popular truss, and will always take its place among the good appliances. It seems to be the happy medium between the French style and the Ratchet truss. The ball and socket movement to the pad allows the truss to become self-adapting to any position of

FIG 71



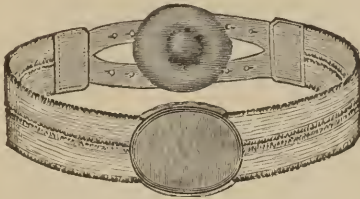
Double Spiral Spring Pad.

the body, such as stooping, mounting a ladder, &c. It has a light flexible spring, is capable of good work, and gives great satisfaction to those who use it.

“Umbilical trusses may be mentioned. We will begin with the treatment of infants. If our nurses were thoroughly educated, and applied a suitable bandage at the first dressing, the truss-maker’s services would rarely ever be needed. Light steel springs covered with soft leather, with a small convex pad, may serve a good purpose; but we find a better substitute in a small flat pad (Fig. 72) a little larger than a silver dollar, with a small convexity in the centre. It should not be too convex or pointed, as that would tend to open rather than contract the orifice. It will give a gentle pressure like the human thumb,

hold the Hernia, allow the ring to contract, and entirely cure the difficulty. This pad may have an elastic band passing round the body, with leather ends, to be secured to two small knobs on the front pad. Great care should be exercised in not

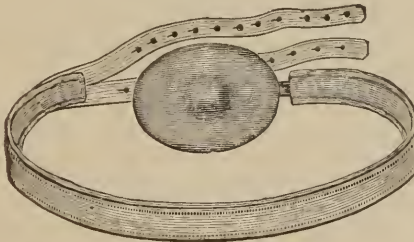
FIG. 72.



Child's Umbilical Belt, elastic.

stretching the elastic more than just enough to keep the appliance in its place (Fig. 73). In the adult we find the most distressing cases of Umbilical Hernia in obese women, many of them the size of an infant's head. Steel spring trusses as a general thing do not meet these cases. The best thing for such cases is a wide French twilled drilling abdominal supporter, say eight or ten inches wide in front, to fit and support the entire

FIG. 73.



Adult Umbilical Truss.

abdomen, passing around the body, and fastened on the sides with four elastic straps and buckles. The next step is to have a large centre pad, to suit the case, stretched to the inner side of the supporter. The pressure is controlled by the elastic side straps.

“There are, of course, many good and useful kinds of trusses not mentioned. My object has been to point out a few only that can safely be relied upon. In cases of inguinal and femoral rupture, there is one principle necessary for a good truss; viz., the inward and upward, or, in other words, the lifting power of the pad. As the inguinal and femoral rings are always above the pubic bone, the pads should be so adapted as to cover the rings securely, always above the bone. Although there may be some exceptions to this general rule, they are so rare that at this time we will not stop to mention them, as my sole object is to give a few practical hints how to meet a want or an emergency until the time shall come when all shall be convinced that *surgery has provided* in the cure by injecting the hernial rings *a substitute for trusses and appliances*, and until those who are afflicted shall come and be thus healed of their distressing malady.”

Bryant says “that in *oblique inguinal* hernia, the pad of the truss should be placed *over the internal ring and canal*, and not over the external ring, the object being to give support to the weak internal ring; in *direct inguinal*, it is placed over the external ring. In *femoral* hernia, when the crural arch is natural and not relaxed, a small pad may be employed over the neck of the sac; but, when the arch is relaxed and movable, a large pad, so adjusted as to press on the ligament itself, is required. After the operation of herniotomy for crural hernia, this fact is worthy of attention; for when a free division of Gimbernat’s ligament has been made, the neck of the sac is always large and the ligaments relaxed.” The improper adjustment of a truss, even if it has no other more serious consequences, may be one of the factors in the causation of varicocele. Hence the proper adjustment is a point worthy of the attention not only of the truss-maker, but of the surgeon himself.

Ever since I began to operate for hernia by the method of

subcutaneous injection, I have been troubled to obtain a proper and suitable truss to be worn by the patient. The trusses that have been in common use are constructed upon a plan that is entirely erroneous. They have a pad of wood or metal, stuffed with hair or some soft substance, and covered with leather. They are thus very heating and inconvenient to the patient, because they prevent the exhalation of moisture and perspiration from the body.

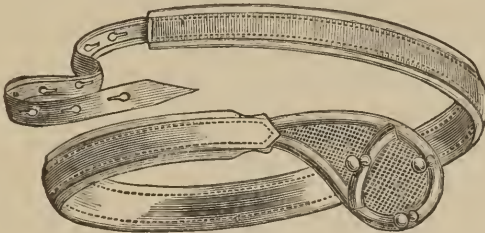


FIG. 74.—ANATOMICAL TRUSS. ANTERIOR ASPECT.

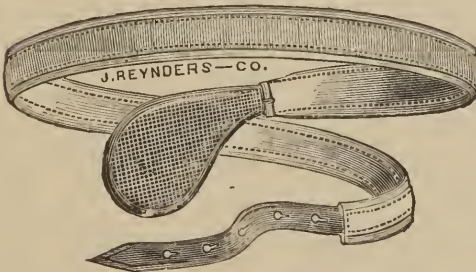


FIG 75. — THE SAME. POSTERIOR ASPECT.

The convexity of the pad is also very objectionable, and is in direct antagonism to the anatomy of the parts to which the truss is applied. By its constant pressure, it has a marked tendency to dilate, weaken, and paralyze the rings, instead of contracting and strengthening them. Thus, in the course of time, the pad that has been worn is no longer sufficient to retain the hernia, is painful and even unendurable, and finally has to be thrown aside, and a larger pad applied.

Recognizing these deficiencies, I have devised a truss which, I think, will meet all the demands. (Figs. 74 and 75.) The pad is composed of a rim of hollow tubing, in sizes from No. 12 to No. 21, over which very fine wire gauze is tightly drawn, and soldered neatly and securely. The plane of the pad is slightly concave, in order to accommodate it to all the anatomical relations, and can be still further adjusted by the surgeon to any individual case. The gauze being drawn tightly over this rim gives us a *flat* pad, which presses upon the body like the human hand, the best of all trusses. The pad is soldered at its neck to the spring, and is so shaped that it will not press upon the spermatic cord in scrotal hernia, nor too hard upon Poupart's ligament in femoral. Neither will it glide over this ligament and slip into the groove of the groin, as does the common pad.

There is a bridge of tubing over the pad, which serves to strengthen it, and may also assist in retaining in apposition to the body a sponge, either medicated or moistened simply with cold water, for the purpose of reducing inflammations. The pressure of the pad can be applied in any desired direction, for there are three knobs for the attachment of the strap.

Between the pad and the integuments, a layer of cotton flannel, either single or double, should be placed; this can be renewed by the patient as often as desired. The perineal band consists of small gum-rubber tubing, or a coarsely braided silken cord. This will be found far more comfortable to the patient than the flat and sharp-edged strap, which soon cuts and chafes.

It will be evident to all that this is a very light and comfortable truss. It is *hygienic* and is accurately fitted to the parts. It is *anatomical*, because it tends to draw the pillars of the rings together rather than to separate them. Hence, even if used without the operation of injection, such a truss is better fitted to effect a cure of hernia than *any convex* pad in use.

This Anatomical Truss has been made, and all my ideas carefully carried out, by Messrs. John Reynders & Co., of New York. I can hardly conceive how a more beautiful spring could be manufactured; it is equally elastic throughout its entire length. I do not know the secret of its manufacture; but I half suspect a peculiar kind of steel is used, perhaps a combination of silver and steel. The tempering is perfect, and the spring has that peculiar elasticity imparted only by the magic hammer in the hand of the mechanic.

The springs are of two degrees of stiffness. One is very soft and gentle in its action, and is adapted for use after the operation of subcutaneous injection. It can be applied in eight or ten days after the operation. The other is stronger, and is better adapted for all those forms of hernia where a truss is to be worn. It can be worn with perfect ease night and day without removal, as it is non-corroding, and is covered with the best grained or Russia leather.

I call the attention of the profession to this truss as the most practical one I have ever seen. It is the truss I should recommend to those who are adopting the method of subcutaneous injection in their practice. It is of course free from all patent or trade mark; but, in order that the profession may be sure of obtaining the very best, Messrs. Reynders will number all that are made, and engrave their name upon them. This will be a guarantee of the excellence of the truss.

CHAPTER XIII.

HYDROCELE AND VARICOCELE.

HYDROCELE.

IN the widest acceptance of the term, hydrocele signifies an accumulation of serous fluid in connection with either the testis or the spermatic cord. Hydrocele by *infiltration* is nothing but an *œdema* of the scrotum, while *true* hydrocele, or hydrocele by *effusion*, has its seat either in the cavity of the tunica vaginalis, or in cysts connected with either the testis or along the course of the cord.

Hydrocele is therefore divided into Hydrocele of the *Tunica Vaginalis Testis*, and the *Encysted* forms in connection with either the testis or the cord.

Hydrocele of the Tunica Vaginalis.—The accumulation of serous fluid in the tunica vaginalis may occur in two different conditions of the sac; either as the *common* form, when the vaginal process has become a closed sac, or as the *congenital*, when the tubular process of the peritoneum has never been obliterated, but remains in open communication with the peritoneal cavity.

Common Hydrocele.—This variety may arise because of either *acute* or *chronic* causes. Under the former may be classed acute orchitis or epididymitis; but this is not the ordinary cause of hydrocele, because the fluid thus poured out is usually absorbed as the inflammation subsides. The ordinary hydrocele is a chronic disease without signs of inflammation in the testis, or

at the most, with only slight tenderness. It usually occurs in middle-aged persons, and without any evident exciting cause, although it may be developed by injury or severe muscular exertion. It results from a loss of balance between secretion and absorption.

The disease begins with a swelling and sense of weight about the testis, which is either hard at the very beginning or at any rate soon becomes hard and tense. The accumulation of fluid begins at the bottom of the scrotum, as a tumor, oval or pyriform in shape, narrow above, broad and rounded below, smooth and tense, and with a semi-elastic feel. This tumor gradually enlarges and ascends up along the cord, but does not enlarge it, unless complicated by hydrocele of the cord. It never enters the external abdominal ring, although it may, when it reaches that point, cause such a deformity as to bury the penis out of sight, leaving only an irregular depression like that of the umbilicus.

The testis, as a general rule, is at the *lower* and *back* part of the sac. It may be flattened and spread out by pressure, causing therefore an elongation of the epididymis and obliterating the pouch which normally exists between the testis and the epididymis. It may also be separated from the back part of the sac by an increase of this pouch, which then forms a second sac, or it may occasionally project into and transversely across the hydrocele sac to form a septum, or it may be so changed in position as to lie in the anterior portion of the sac, instead of in the posterior. All these variations should be borne in mind, in any given case, as possible complications.

The serous fluid that is found, is simply an excess of the natural secretion of the cavity, or else it is this secretion slightly modified by inflammation. It is generally clear and limpid, and of a straw color. In old hydroceles, it may become brownish from disintegrated blood, or, rarely, it may be milky white. In

either case, it is opaque rather than transparent. In composition, it is albuminous and alkaline, with occasional crystals of cholesterolin. The quantity varies, but averages less than a pint. The largest amount on record is that withdrawn by Mr. Cline from the historian Gibbon. This amount was six quarts!

The examination of hydrocele is simple, and is directed to three characteristics. First;—the *testis* is found at the bottom and posterior portion of the scrotum. Second;—there is a sense of *fluctuation*. Third;—the swelling is *translucent*. The last is the most positive sign, and may easily be determined by viewing the tumor through a roll of pasteboard, in contact with both it and the eye, in order to shut off all direct light and enable the surgeon to get only transmitted rays. The position of the testis is then recognized by a dark mass lying at the posterior part of the scrotum.

This test is, however, not an infallible one, although it is usually sufficient for practical purposes. It may happen that the sac, which is generally thin, may have become dense and thick like pasteboard, or cartilaginous, or even osseous like the case reported on page 346. It may also be lined in some cases by a kind of false membrane, and occasionally may be divided into nearly distinct compartments by septa or bands, or even by the testis itself, as has been already mentioned. By conducting the test in a darkened room, however, it may be rendered available, even in these cases.

Hydrocele may be confounded with *Serotal Hernia*, but is distinguished by its translucency, by its abrupt termination at the external abdominal ring and its non-invasion of the inguinal ring, by the absence of impulse upon coughing, and by the history of growth, whether proceeding from above downward, or from below upward. Other differentiations may be found in Table No. 3, page 80. Hydrocele and hernia are not infrequently co-existent, the hernial sac descending in front, behind, on one

side of, or into the sac of the hydrocele. This was the case with Gibbon, who died from an irreducible hernia reaching to his knees.

Hydrocele is distinguished from *Cystic Disease of the Testis* by the fluctuation being general instead of circumscribed; from hæmatocele, or collection of blood in the tunica vaginalis, by its translucency. When the hydrocele is non-translucent, the diagnosis must be aided by the trocar. See Table No. I., page 78.

Congenital Hydrocele. — Since there is an open communication between the tunica vaginalis and the peritoneal cavity in this variety, the serous fluid can easily be returned by pressure into the abdomen, especially in the recumbent position. The sac will then gradually refill, when pressure is removed or when the patient stands up. It thus differs from common hydrocele, but resembles hernia. It may be differentiated from the latter by its translucency, and from the “acquired” forms of hernia by the less perceptible evidence of the testis at the bottom of the scrotum.

Encysted Hydrocele of Testis. — Here the fluid is not in the tunica vaginalis, but in a cyst projecting from the epididymis or the testis, and has pushed the serous covering of the gland before it. It differs from common hydrocele in being situated above, below, or to one side of the testis, instead of enveloping it. Curling has pointed out that these cysts, which are small and multiple, are more common on the epididymis than on the testis. They are very liable to rupture into the tunica vaginalis, and contain many spermatozoa, as was pointed out by Liston. This is probably due, according to Curling, to the “accidental rupture of a seminal duct into an already existing cyst.” The tumor is both fluctuating and translucent.

Hydrocele of the Cord. — This is characterized by the presence of a cyst containing serous fluid and situated on the cord near the testis, or within the inguinal canal and near the internal

ring, or at any intermediate point. It is always distinct from both the testis and from the tunica vaginalis. It is elastic and translucent, and can be reduced into the abdomen, but receives no impulse on coughing and does not change size by compression. When it lies in the inguinal canal, it is with great difficulty distinguished from inguinal hernia. See, however, Table No. 4, page 81.

It seems to be formed by the incomplete obliteration of the funicular portion of the vaginal process of peritoneum; or it may be a distinct cystic growth. It is most frequent in children or young boys, although it may occur at all ages.

Diffused Hydrocele of the Cord. — This term has been used by Pott and by Scarpa, but it signifies only an *œdema* of the cord and not a cystic formation. Its treatment is on general principles; usually by counter irritation with blisters, or with external applications of iodine, until desquamation is produced, or even with mercurial ointments in simple cases.

Operations by Hydrocele. — The treatment of hydrocele is either *palliative* by tapping, or *curative* (sometimes called radical) by tapping, and afterward exciting inflammatory processes within the sac.

Palliative Treatment. — A few precautions are necessary to avoid injuring the testis or puncturing the scrotal veins. The scrotum being held in the surgeon's left hand (or in the hand of an assistant), and put upon the stretch, the trocar is plunged into the tumor a little below its middle. (Fig. 76.) The trocar should be introduced boldly, so as to penetrate the tunica vaginalis and not permit the instrument to slip into the areolar tissue between the skin and tunica vaginalis. Inattention to this point may lead to infiltration and sloughing of the scrotum. The direction of the puncture should therefore be at first directly back; but, as soon as the sac is perforated, the trocar should be directed upward so as to avoid the testis. (Fig. 77.)



FIG. 76. — Puncture of Hydrocele.



FIG. 77. — Direction of trocar in making the puncture.

I use as small a trocar as it is possible to get, and in the majority of my cases I find my spiral aspirating needle (figured on page 216) the best.

The trocar being withdrawn, if one has been used, the fluid is evacuated through the canula, and the puncture spot, if necessary, covered with a piece of adhesive plaster. The relief thus obtained is, however, only temporary, and the sac may gradually refill and demand another tapping.

Curative Treatment. — This method seeks to excite an inflammatory action within the sac after the fluid has been withdrawn. Whether this inflammatory process is for the purpose of creating adhesions between the two walls of the tunica vaginalis, or for the purpose of restoring a functional equilibrium, will be later discussed. At any rate, it is a well-known fact that methods which have been very successful will sometimes fail, and that

then successful treatment will often require the exercise of the greatest ingenuity of the surgeon.

Seton. — This method, although formerly much used, is rarely employed at the present day because of the danger of exciting too serious inflammation. It is performed by inserting a few strands of silk into the sac after the fluid has been withdrawn. The silk is usually removed after about thirty hours. Silver or iron wire have been proposed as setons.

Incision. — With the patient under ether, the tumor is opened from above downward and charpie or lint placed in the cavity to excite irritation and suppuration. This is a method that has been used since the time of Celsus and Guy de Chauliac, but the pain and accidents that result from it, as well as from the method of excision, would seem enough to render caution advisable in such procedures, especially in view of the fact that simpler operations are at hand.

The German "Schnitt" method has, however, been performed this present year three times by Mr. Joseph Lister, F.R.S., with antiseptic precautions, at King's College Hospital. The bleeding points were ligated and the sac stitched to the skin with cat-gut, but the wound left unclosed. The cases were reported cured after a period varying from two to three weeks.

The chief point of interest in the last case was the total absence of all irritation of the skin of the scrotum. "This irritation had been a distressing symptom in the two earlier cases, in which carbolic dressings had been used; but the new eucalyptus gauze dressing was entirely free from this inconvenience. The scrotal skin being extremely sensitive to the action of irritants, this was a good test of the non-irritant qualities of the gauze; its antiseptic qualities were also severely tested and were not found wanting."

Another antiseptic preparation, which is said to be many times more powerful and much less harmless than carbolic acid,

is a combination of principles extracted from thyme, eucalyptus, baptisia, gaultheria, and mentha arvensis, together with benso-boracic acid. Time and experience will show the comparative merits of these various antiseptics.

Excision. — The incision into the scrotum being made as above described, a portion of the tunica vaginalis is removed with the scissors or knife and the wound allowed to heal under the water dressing. It has been in use from very early times and has been variously modified, but since it is painful and not to be depended upon with any degree of certainty, it is another of the methods to be tried only after the method of injection has failed.

Injection. — This is no new treatment of hydrocele, since Celsus in his day advised the surgeon to inject solutions of nitre or saltpetre into the sac after it had been emptied. It did not, however, get into general practice in either England or France until after the memoir of Sabatier.

Different fluids have at different times been injected. Lember used line-water charged with corrosive sublimate and injected it also through the same canula by which the serum had been withdrawn. Red wine, port wine, and pure alcohol have all been tried and are even now used in combination. Leveret used a solution of caustic potash. Bertrandi and Cooper were very successful with sulphate of zinc, in the proportion of a drachm to the pint of water. Velpeau once used spirits of camphor with success. Bécларd used cold water, while milk, the serum of the hydrocele itself, solutions of salt, of alum, of tannin, and of iodine have all been tried with more or less success.

The operation, too, has been performed in various ways. Some have injected large quantities of fluid, and others only a small amount. Some have allowed the injection to remain in the sac, while others have allowed it to escape after the lapse of a short period, varying from a few minutes to a half hour.

The injection is usually made through the same canula by which the serum has been withdrawn. After injecting an amount of fluid sufficient to distend the sac to the size it had before it was tapped, the syringe is withdrawn and the open end of the canula plugged for a few minutes by the end of the thumb. It is preferable then to evacuate the fluid from the sac.

Three practical points should never be lost sight of in performing the operation. In the first place, the canula should be known to be within the cavity of the tunica vaginalis before any injection is attempted. In the second place, care must be taken that when the patient cringes, as he probably will at the moment of injection, the canula be not displaced or withdrawn so that some of the fluid can escape into the cellular tissue of the scrotum and cause a diffuse inflammation or even a slough. Finally, when the canula is being withdrawn, the sac should be nipped between the finger and thumb, to prevent this same infiltration.

A small piece of adhesive plaster will be sufficient to close the puncture that has been made. Sometimes, after the injection, the scrotum is covered with compresses soaked in the compound tincture of iodine, but in general it is fully as well to allow the scrotum to be free or at most to suspend it in a bandage after the first day. The cure is usually complete in about fifteen days, although sometimes suppuration sets in and prolongs the treatment. One injection is generally sufficient.

Iodine is the fluid now almost universally used for injection, although I have no doubt that the fluid extract of oak bark or a solution of the sulphate of zinc would be effectual. I have never tried them. My favorite injecting fluid has been for years the officinal ethereal tincture of iodine reduced one half with water. The use of iodine was first introduced into practice by Mr. Martin at Calcutta, and we have already seen, on page 128, that Velpeau was led by the practice of injecting hydrocele

with iodine to consider the possibility of curing hernia by injecting the hernial sac with the same fluid.

Mr. Martin estimated that in India the failures by the operation did not amount to one per cent, while Velpeau calculated them in France at three per cent. The explanation of the cure seems to offer a choice between two theories; either an adhesive inflammation is set up which obliterates the cavity of the tunica vaginalis, or else the membrane is inflamed to the degree necessary to restore the natural equilibrium between secretion and absorption.

Erichsen states his belief that it is a well-known fact that a cure by injection is *not* obtained by causing an obliteration of the sac of the tunica vaginalis, but by restoring the functional equilibrium. He therefore would offer, as one cause of failure, an insufficient inflammation to bring about this result. Another cause, he thinks, is, that from the inflammation that is set up, an effusion takes place into the sac which is not absorbed, but which serves to distend the cavity of the tunica vaginalis.

Both of the arguments offered by this surgeon seem somewhat probable from some clinical facts that are at hand. I once treated an enormous hydrocele that reached nearly to the knees, and which yielded about three quarts of straw-colored fluid on tapping. A silver probe with not more than one eighth or one quarter of a grain of biniodide of mercury in dry powder upon its moistened tip was now passed through the canula and thoroughly swept around the tunica vaginalis. Two rolls of cloth, one on either side of the testis and a little in front of it so that the three elastic bands which held them in place might not compress the gland, were used as compresses to the sac. With this simple dressing, the patient was cured at the end of about fifteen days. The inflammation was active, but not very painful; not nearly so painful as when I have injected iodine.

Whether the application of the mercury, or the pressure of the

compresses were the important factors in the cure of this case must yet remain a disputed point. I remember another hydrocele that was very interesting to me several years ago. A young man was subject to intermittent attacks of effusion into the tunica vaginalis. The fluid would appear to the apparent amount of six or eight ounces, and then would disappear as mysteriously as it came. This would seem to favor the theory that a disturbance of function is the cause of hydrocele. I had frequently relieved old cases of gonorrhœa by painting the under portions of the glans penis with a strong solution of iodine; so in this case I thought of painting the entire scrotum in a similar way. I did this until desquamation was produced. The result was a cure. The success of the treatment may, in the minds of some, seem to strengthen the theory under discussion.

I have also treated cases by allowing the fluid to ooze through a fine aspirating needle, and then painting the scrotum with a strong solution of carbolic acid in several places. I then insert into a cork three small sail needles with triangular points, and tattoo those parts of the scrotum that I have painted; the acid seems to paralyze temporarily the sensitive nerves of the skin. With the after-treatment of compression, this method will often prove successful in youth and in cases of short duration. Then again, I have found, in many cases, that, by irritating the walls of the sac as I withdraw my needle and by only slightly compressing them, I have gained very satisfactory results.

On the other hand, it is the theory generally accepted that compression of the sac, or, at any rate, adhesive inflammation set up upon the walls of the sac, are necessary to secure a cure, and it is this theory that suggested the Curative Method of operation. So that the best we can do at present is to leave the matter an open question, and not decide *in toto* with either party in the strife. In some cases, a cure seems to be produced by adherences in the walls of the sac, in other cases, by a modi-

fication of function, and in others, by a combination of both processes. We all know, too, that there are cases which do not yield to one method, but that seem to yield to another, and that finally there are cases which seem to yield to no usual operation, but baffle all attempts at remedy, except the more severe operation of excision of the sac. Cases of long standing that have much perplexed the surgeon have also been known to recover fully after being freely opened with an ordinary thumb lancet and allowed to heal by granulation.

VARICOCELE.

This enlarged condition of the spermatic veins is commonly met in young persons from puberty to the age of thirty. It is sometimes known as *cirsocele* and also as *spermatoccele*. It usually occurs in persons who have the scrotum loose and pendulous.

The *left* spermatic veins are much more frequently varicose than the right, partly because of the pressure of fæces in the sigmoid flexure, and partly because of the fact that the veins on the left enter the renal vein at a right angle, while those on the right enter directly into the inferior vena cava. Brinton offers as an explanation, "the existence of a very perfect valve that he discovered at the entrance of the right spermatic vein into the vena cava, which thus supports the column of blood on the right testis, while there is no valve at the termination of the left spermatic in the renal vein."

The causes of this varix are both *predisposing* and *exciting*. Under the former may be classed the tortuous anatomical structure (plexus pampiniformis) and loose surroundings in the scrotum; under the latter, any exertion which affects these veins, such as long-continued walking or straining at stool. It is sometimes the case also that venereal excesses, or on the other hand extreme continence, may be exciting causes. Since the

improper application of a truss may have an influence in causing a varicocele to appear, the reader is referred to page 320 for direction in regard to the proper adjustment of such a support.

The symptoms of varicocele consist of a tumor, knobbed and convoluted, feeling to the touch like a *bundle of earth-worms*. It is inelastic and compressible, diminishes slowly in the recumbent position, and sometimes gives a slight impulse on coughing. Often the swollen veins can be seen through the thin scrotum. There is usually little or no pain, but there is a sense of tension and weight when the patient is standing. The testis undergoes a certain amount of atrophy, so that it may even be concealed beneath the mass of dilated veins.

Varicocele is liable to be confounded only with scrotal hernia, but can readily be differentiated from it by Table I., on page 78.

Operations. — The treatment is either *palliative* or *curative*, as in hydrocele. The necessity for operative interference must depend upon the individual case, whether the pain and inconvenience be unsupportable, or the testis atrophying, or the general health failing and the person suffering from mental disquietude and hypochondriasis. The patient often thinks constantly of copulation, but is fearful that he is losing his virile powers. A few words of explanation and encouragement from the physician will often do much to dispel such gloomy forebodings. When the varicocele is due to engorgement of the testis, the stimulus of occasional sexual intercourse has been recommended to relieve it.

Palliative treatment consists in supporting the varicocele in a suspensory bandage or an elastic bag. Mr. Curling has recommended a truss bearing upon the external ring, with the idea of preventing any efflux of blood into the veins during any sudden exertion. In some cases, support may be given by drawing the scrotum through a ring of metal covered with soft leather, and by this means suspending it.

Curative treatment consists in the obliteration of the enlarged veins by compressing them, and thereby exciting inflammation. For this purpose, the ancients used the cautery, but in more modern times the following plans have been proposed: compression with forceps, compression with hare-lip pins and the twisted suture, subcutaneous compression between a pin and wire, ligature, and subcutaneous ligature.

Breschet's Operation. — This produces a slough by clamping, in a pair of forceps, a fold of the scrotum in which the dilated veins are included. After forty-eight hours or less, the parts will have become a dry eschar which is soon followed by an ulcer and cicatrix.

There are many modifications of this method, prominent among which is the plan of Landouzy. This consists in using a pair of forceps which shall not compress the fold of skin, so that, after the sloughing of the eschar, a sort of cutaneous bridge is left.

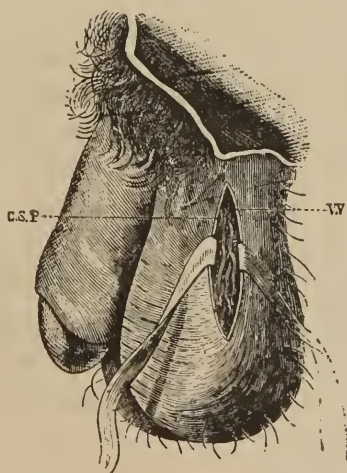


FIG. 78. — Rigaud's method in Varicocele, C.S.P. Spermatic cord, V.V. Varicose veins under which is passed the tape.

Velpeau's Operation. — In this method pins are used in place of forceps. Over these pins a figure of 8 suture is passed so

as to include the veins and a fold of skin. As, however, erysipelatous inflammation was liable to follow, the operation was subsequently modified and made essentially like Pancoast's earlier method, which will be described on a later page.

Simple Isolation. — Rigaud's method. An incision is made through the skin for the greater part of the length of the scrotal sac and a tape passed beneath the mass of veins. The wound is then dressed with lint until suppuration is set up and the vascular mass mummified. This takes place by the third day.

Ligation. — This was the operation of Celsus. A vertical incision of nearly an inch is made in the scrotum over the tumor of veins. The vas deferens, artery, and nerves are then, as in all the operations, separated from the veins. Under the latter a straight needle is passed and a stout thread twisted around it in the form of the figure of 8 so as to compress them. After five or six days the patient may sit up, and after as many more he may walk about. Cold-water dressings are the best to be used.

Intermediate Ligature. — Raynaud's method. The veins are taken up with a fold of the skin and a thread passed under them by means of a curved needle. The ligature is then tied over the skin, which is afterwards divided with the bistoury. The ligature is tightened every day until the veins are divided; this usually takes place in fifteen or eighteen days.

Subcutaneous Ligature. — Gagnebé's method. The ligature is passed *under* the vessels by a curved needle and then *above* and over them, the needle making its exit from the skin at the point of puncture. The objection to the method is that the ligature cannot be easily tightened, and that therefore section of the veins takes place slowly.

Malgaigne therefore ties the ends over a roll of diachylon on the end of a probe. Erichsen has further modified the operation by using silver wire, which can be twisted to gain any desired degree of compression.

Ricord's Method. — This is a modification of Gagnebé's operation. A double thread is passed *behind* the veins and out through the scrotum. Another double thread is passed *in front* of the veins and through the punctures that have been already made. By passing the free ends of each ligature through the opposite loops and drawing upon them, the veins will be constricted. Formerly the free ends were then wound over a sort of tourniquet, but later M. Ricord found that mere traction without ligation would be equally effective.

Pancoast's Method. — This operation is a modification of Ricord's, and seeks to strangulate the veins by means of a straight needle and double ligature. Formerly he passed the *ligature behind* the veins, between them and the duct, but inserted the *needle in front* of the veins, between them and the skin. The loop of the thread was then thrown over one end of the needle, and the free ends tied upon the other extremity of the needle.

Later, Dr. Pancoast passed the needle, threaded with a strong silken cord, between the veins and the duct, and repassed it in front of the veins and out at the point of puncture. The free ends were then tied over an ivory plate upon the scrotum. This is essentially the same method as that of Malgaigne, already mentioned.

Operation of Vidal de Cassis. — This combines the subcutaneous ligature of the veins together with a diminution of their length. A pin is inserted *behind* the veins and then a silver wire is passed *in front* of them, but through the same punctures by which the pin was inserted. The ends of the wire are then twisted over the pin, and every day the pin is rolled up so as to twist another turn or two of the wire around it.

Author's Operation. — My method of operation is extremely simple, but I do not claim that there is anything in it original with me, since it was performed by many other medical gentlemen before I ever attempted it.

About three-quarters of an inch below the roots of the penis, and immediately over the veins, a vertical incision one half-inch in length is made. For this I generally use the demonstrator's



FIG. 79. — Demonstrator's Knife.

knife, which is the device of my son, Mr. Charles E. Warren, Student in Medicine. In opening the sheath of the veins, a drachm of serous fluid, which has exuded from the varices, often escapes.

After separating the veins from the cord and arteries by gently rolling the mass between the thumb and finger, the unsharpened curved end of the knife is passed beneath them and raises them up through the incision. About an inch from the tip of this blunt end is an eyelet, through which a stout silver wire has previously been threaded; so that, as the bundle of veins lies in the curvature, the wire lies fully *under* and projects beyond them.

The wire is then drawn *over* them and twisted or tied. The ends are cut short and pressed down, so that they may not cause irritation, and the veins allowed to fall back into the scrotum. The incision is then secured by a strip of adhesive plaster.

A second incision is made about an inch below our first one, or at least below the enlarged veins. The process of ligation is the same as before. After this operation, a suspensory handkerchief is all that is necessary. Should swelling occur, applications of cold water, or of lead lotion with laudanum, are very useful.

In the course of eight or ten days the swelling will subside. It will then be found that between our ligatures an effusion of plasma has solidified the veins. They will subsequently atrophy to a mere shred. The sutures are allowed to remain in position and never cause any trouble. The method may almost be called subcutaneous, since our incisions are so small that they readily coapt and cause little loss of blood.

CHAPTER XIV.

OBSERVATIONS ON HERNIA.

It may be fitting, in this place, to give a few words of explanation in regard to the apparently heterogeneous character of the present chapter. Since the publication of the first edition of this book, many points of detail and several new operations have been brought to the author's attention. Some of these suggestions are of prime importance and great value, while all of them are as much a part of the body of the book, and belong as properly to it, as though they had been published in the first edition. They do not in any sense belong to an appendix, which is often only a collection of points of minor importance, and therefore not worthy of a dignified position in the body of the book.

The book had been, however, already stereotyped both in England and in America. In order, therefore, to use a portion of these plates, as far as practicable, consistent with a thorough remodelling and revision of the whole work, it has been thought better, by all means, to mass all such additions and new operations into a separate chapter, with appropriate references to the matter that had been already written, rather than to throw them into an appendix.

¹ PAGE 42.

Because of the difficulties in diagnosis, Heister wished that inguinal could be distinguished from femoral hernia by the terms *internal* and *external inguinal*, since both varieties occupy, in an extended sense, the inguinal region. This, however, would be merely a change in terms, and would serve only to confuse more thoroughly the whole classification. See page 33. Sir Astley Cooper thought the diagnosis could be made by considering the relation of the neck of the sac to the spine of the pubes, "the sac of inguinal hernia being placed above, while that of femoral is below, and to the iliac side of the spine." But this is not a conclusive test, since a relaxation of the inferior pillar

of the ring, or a deficient development of the intercolumnar fibres, occasionally allows an inguinal hernia to assume this same position.

It has also been supposed that all herniæ above a line drawn from the spine of the ilium to the spine of the pubes are inguinal, while those below are femoral. But Poupart's ligament, which this line is supposed to represent, does not actually describe a straight line, and is so much relaxed and curved downwards, particularly in women who have borne children, that it actually allows many inguinal herniæ to be situated below this imaginary line.

Malgaigne proposes a plan for making a certain diagnosis in such difficult cases where Poupart's ligament is relaxed and defies detection, and where the tumor recedes so suddenly on pressure as to render it impossible to tell the point at which it disappeared.

His directions are as follows: "Reduce the hernia, feel with the right forefinger the pulsations of the femoral artery, and, applying the pulp of the finger on the pubic side of the artery, press backward toward the pubes. Sometimes in thin persons you will feel the femoral ring open, bounded in front by Poupart's ligament, behind by the pubes, on the iliac side by the vein and artery, the pulsations of the latter being felt through the interposed coats of the vein on the side of the finger; then it is unnecessary to proceed further. In the natural state the finger never could thus penetrate into the femoral ring. But suppose the subject to be fat, the hernia small, and the ring too deep and narrow to admit the finger, you must press against the pubes whilst you perceive the pulsations of the artery against the side of the finger, and cause the patient to cough.

"If the impulse is felt by the finger, and the hernia does not escape, it is femoral; but if the impulse is not perceived and the hernia escapes above, it is inguinal. Occasionally an inguinal

hernia escapes above, and at the same time communicates an impulse to the finger. This effect can result only from one of the two following causes : either it is an inguinal hernia which distends the inguinal canal and transmits an impulse below Poupart's ligament, or else the hernia is femoral, and has distended and pushed forward Poupart's ligament and a portion of the aponeurosis of the external oblique, so as to cause a projection above the ring which you have obstructed. You then with the right forefinger close the femoral ring, and having placed the left thumb transversely about three lines above it, cause the patient to cough, whilst you slowly withdraw the forefinger. If the hernia be inguinal, it is thereby retained ; if femoral, it protrudes."

It has long been known to surgeons, that persons often live for years affected by a femoral hernia which had escaped all notice. The formation of such an incipient hernia has been already mentioned on page 35. For the method of diagnosing the hernia in this early stage we are indebted to Malgaigne. His rule is to place the pulp of the forefinger firmly on the pubic side of the femoral artery, and just below Poupart's ligament. The patient is now made to cough, and if a hernia exists the finger will receive an impulse. This impulse here is never normal.

These directions are applicable only to reducible herniæ. If the hernia has become irreducible, the surgeon must endeavor to trace the neck of the sac. This can be most effectually done whenever Poupart's ligament cannot be satisfactorily traced over the tumor, by pushing the hernia upward and pressing with the pulp of the forefinger in the direction of the femoral aperture. "If the hernia be femoral, more especially if it be strangulated, a firm, resisting, and sometimes painful substance will be found occupying the femoral ring, and preventing Poupart's ligament from being felt."

² PAGE 42.

GASTROCELE, or more commonly epigastrocele, is a name applied to a hernia occurring toward the upper part of the linea alba, or in the epigastric region, whether formed or not by the stomach. Its existence has been doubted by many.

³ PAGE 42.

Hepatocele. Probably increase of the bulk of the liver or injuries of the abdominal parietes are the cause of the protrusions occasionally met with in those infants in whom the upper part of the linea alba is very weak. The liver has never been found entirely out of the abdominal cavity. Sauvages distinguishes two kinds of hepatocele, — the ventral, *i.e.* in the linea alba, and the umbilical.

⁴ PAGE 42.

Cystocele is rarely congenital, but results from violent exertion, injuries, excessive straining in micturition, and occasionally follows pregnancy. In its simplest form, it is a mere protrusion of the mucous membrane through the urethra. This may even increase to a prolapse of the bladder. In other cases, the bladder prolapses at one of the usual seats of hernia; in the male more frequently through the inguinal ring, and in the female under the femoral arch, in consequence of the different size of these apertures in the two sexes. In these cases, adhesions occasionally form between the bladder, viscera, and the sac. The flow of urine may be thus impeded, causing cystitis, calculi, or even septicæmia. Very rarely the prolapsed portion of the bladder may become strangulated. When the urine is retained, the catheter may aid in diagnosis. In very rare cases, herniotomy may be necessary to relieve the strangulation.

⁵ PAGE 43.

Irreducible hernia may be caused by enlargement of the omentum or mesentery, as, for example, by an accumulation of fat. Adhesions between the sac and its contents, or adhesion of the neck of the sac from inflammation, blows, etc., may often produce the same result, with either contraction of the neck or hour-glass contraction of the sac.

⁶ PAGE 43.

An *incarcerated* hernia may be caused by an accumulation of feculent matter or flatus in the fold of protruding intestine. This attack is often preceded by constipation or the swallowing of hard and indigestible food. It is most common in elderly persons with large abdominal cavities.

⁷ PAGE 43.

Strangulation occurs in two distinct forms of hernia, — in the old and long-standing, and in the newly formed. Distention of a pre-existing protrusion by feces, etc., or by venous congestion, may also occasionally act as a cause. Spasm, which was formerly regarded as a cause, can have little, if any, effect in the causation, since the hernial orifices are tendinous or ligamentous, not muscular, and hence can be subject to muscular contractions only indirectly.

⁸ PAGE 44.

The following statement has been obtained by Dr. John L. Sullivan, in his examination of men for the military service in the late War of the Rebellion:—

Number of men examined,	10,000
Number rejected for herniæ,	455
	or 45.5 per 1000

Varieties.	Femoral hernia, — Right,	1	
	Double,	1	
		—	2
	Umbilical,		6
	Ventral,		9
	Inguinal, — Right,	234	
	Left,	173	
	Double,	31	
		—	438
			<hr/>
			455

The rarity of femoral hernia, not merely in comparison with inguinal hernia, but with the other and less frequent forms, is very striking. It is also worthy of note that the right is the affected side in very nearly two thirds of the cases of inguinal hernia. It will be seen that the proportion of persons with a hernia is nearly one in every twenty. This is about the estimate made by authorities who base their calculation upon the total population.

9 PAGE 73.

According to Sir Astley Cooper, the peritoneum, in forming a common hernial sac, "is not dragged from its natural position, but becomes elongated by gradual distention; and it is usually not only lengthened but slightly thickened, for a long-continued pressure of moderate force will produce an elongation and thickening of fibre, though a greater degree will bring about an entire absorption of parts."

10 PAGE 73.

In this connection the following case of Double Hernia with Ossified Tunica Vaginalis, together with the operation and cure, performed and reported by Dr. H. S. Greeno, of Kansas City, Missouri, may prove of interest to the profession:—

Rev. Mr. H——, aged sixty-six, residence Lyon Co., Kansas, presented himself for treatment for radical cure of double rup-

ture, October 13th, 1880. I found upon examination an oblique inguinal hernia of the right side, of thirty-five years' standing, which had become scrotal, and an oblique inguinal hernia of the left side, of fifteen years' standing. The tumor of the left side was quite small, the bowel being easily retained by a truss. The external ring of the right side was very large in size, about two inches by one. The opening was so large that it was impossible to apply any truss that would retain the bowel within the abdominal cavity; this gave him much pain and annoyance. He could stand upon his feet but a short time before being compelled to sit or lie down. I discovered one very serious obstacle which rendered an operation for radical cure very difficult, if not impossible. The right testicle was enormously enlarged, measuring about thirteen inches in circumference, and weighing over one and a half pounds. The weight of the organ would interfere with an attempt to occlude the rings by the Heatonian plan of treatment. The patient informed me that this testicle had been enlarged as "long as he could remember." From his earliest recollections the right side was the largest, and continued to enlarge until some twenty-five years ago, when it seemed to become stationary; never gave him any pain, but was a great source of annoyance. After considering the case, and consulting with several of the profession, who examined the case with me, I concluded to remove the enlarged testicle, and, if successful, to attempt an operation for the radical cure of the hernia. Accordingly, on the 18th of October, in company and with the assistance of Drs. Cooly, Lewis, Dearrit, and Derrey, I removed the enlarged testicle.

Now comes the most interesting part of the case. Upon examination it was found that the tunica vaginalis had become thickened and almost perfectly ossified, in some places cartilaginous. The osseous formation was quite perfect, and quite as solid as ordinary bone. It formed a complete shell, and con-

tained within its cavity twelve ounces of pus. No traces of the testicle or epididymis could be found within the ossified tunica.

The spermatic cord and vas deferens were entirely absent within the cavity. How long this pus had been confined within the cavity of the tunica is a question, — doubtless for years. I do not remember ever to have seen in any of our text-books or journals a case similar to the above.

The operation proved successful, notwithstanding the age of the patient being greatly against him. He made a good recovery, and on the 2d of November, fifteen days from the time of removing the diseased testicle, I operated for radical cure of his rupture of the right side, using the Heatonian operation, as modified and improved by Dr. Joseph H. Warren, of Boston. This operation was also a success, and on the 12th of November I allowed my patient to return to his home in Kansas. I concluded not to operate on the left hernia, as it gave him but little trouble, and was easily retained by the proper adjustment of a light truss.

Under date of May 15th, 1881, Dr. Greeno writes to the author that this gentleman "returned to Kansas City in April last, and submitted to an operation for the cure of the left side; so that he is now cured of both herniæ."

11 PAGES 75 AND 87.

Symptoms Simulating Strangulation in Inflammation of Empty Hernial Sacs. — At a meeting of the Vienna Physicians' Society (*Mittheil. des Wiener Med. Doct. Colleg.*, vol. vi., No. 26, December 2, 1880), Dr. Englisch read a paper with the above title. Forty cases had been collected, and in thirty herniotomy had been performed. His own experience extended to six cases, of which number, four had concerned women. In the latter cases femoral hernia was observed exclusively. If, in consequence of

some irritation or traumatism, the peritoneum of the sac became inflamed, symptoms of strangulation would be developed, even if the sac had no intestinal or omental contents. The protrusion would first of all become exquisitely painful, rapidly increase in size, and become tense. In some few instances the augmentation in volume had been slow.

The quality and extent of the pain might aid differential diagnosis, without, however, being so characteristic as to exclude the possibility of error. In actual strangulation, the most intense pain would be felt at the constricting ring, and thence extend into the abdomen. If an empty sac became inflamed, the hernial protrusion would be most tender, and pain might be absent at the ring. This symptom was, therefore, not reliable in all instances, nor would such differences be found in cases of longer standing. The condition of the integument afforded a better clue to differential diagnosis. Provided rude taxis had not been resorted to, the skin over a strangulated hernia would be found unaltered and freely movable. In inflammatory action about an empty sac, the subcutaneous tissue would become infiltrated, the skin itself would grow red, and after one or two days would adhere to the subjacent tissues.

Vomiting was not a characteristic symptom. It might get progressively worse in inflammation of an empty sac. Constipation was equally unreliable, although there was no mechanical obstruction; cases had been observed in which enemata and purgatives had produced no action of the bowels, not even the escape of flatus. The condition of the hernial tumor was not a trustworthy guide to go by. In inflammation of the empty sac, it might be impossible to effect a reduction in the size of the protrusion, just as in true strangulation. As regards the temperature of the body, it might materially aid differential diagnosis. In strangulated hernia, a febrile movement might be postponed to the third or even fifth day, whereas in in-

flammation of an empty sac, an early rise of temperature took place.

In most cases of the latter description, the patients belonged to the female sex. This was owing to the fact that in women crural hernia was more frequent, this variety being, also, the one which oftener led to inflammation of the empty sac. No single symptom, therefore, could be safely relied upon, and even the conjoined presence of several might still lead to a wrong diagnosis. Surgeons were incidentally cautioned against pumping air into the bowels in giving injections, because the re-escape of such air might mislead one to assume the presence of flatus.

12 PAGE 75.

The principal thickness of the covering of a hernial sac is the superficial fascia, especially if the patient has a tendency to obesity. Its loose connections, yielding nature, and varying amount and want of permanence of fat, which is its chief bulky constituent, offers little obstruction against the descent of the hernia; and in the operation of injection is little used as an effective agent of security. That it performs a secondary part in the operation may, however, be seen on pages 147 and 170.

Its looseness is so great in some patients that an inexperienced hand may invaginate the scrotum under the skin of the groin so as to produce the appearance of having entered the external ring without getting into the inguinal ring at all. It is recorded that operations have even been done under these circumstances with results easily to be imagined. As a general rule the structures involved in the anatomy of inguinal hernia are more decidedly evident to the touch, and their connection with each other less firm, when the hernia has been present in the canal for any length of time. This is remarkably the case in old scrotal herniæ.

13 PAGE 86.

The different points at which the layers of the abdominal walls react upon a distended hernial canal and produce strangulation give us some hints of the assistance which nature will render in effecting a closure of the canal. The most frequent situation of strangulation is at the internal opening of the sac into the peritoneal cavity. Except in a certain class of cases, the increased danger of entering the abdominal cavity with instruments would deter the surgeon from too freely including this part of the hernia in his manipulations.

The next situation in the order of frequency of occurrence is at the lower border of the internal oblique and edge of the conjoined tendon. These structures can be easily reached. Occasionally, but least commonly and generally in large herniæ, strangulation occurs at the external ring. This part may be reached and operated upon with the greatest ease and is effectually closed by adhesive action. If, however, nothing more is effected than the contraction of this distended ring, its closure does not prevent the formation of a bubonocele in the unclosed canal above, but may even allow a strangulation to occur at the internal ring.

14 PAGE 88.

In recent herniæ which have become strangulated in young and healthy persons, inflammation soon begins in the protruded intestine and that part of it which lies above the stricture. If relief is not obtained, the intestine below mortifies or ulcerates. In recent strangulated herniæ, there is pain in two distinct places; at the umbilicus and extending from it to the pit of the stomach, and also in the hernial tumor. Both may be equally acute to the touch as well as to the sense of the patient. In old herniæ that become strangulated, the pain is felt at first, and

often for a long time, at the umbilicus alone. It is a peculiarity in inflammation of the intestines that the pain is referred to the umbilicus, whatever part of the intestines may be inflamed, be it jejunum or even rectum. Acute pain in this region, and also in the tumor in recent herniæ, serves to mark a high degree of inflammation.

PAGE 90.

Dr. Lange, of New York, reported on March 8th, 1881, a case of "reposition *en bloc*" made by the patient himself in the forcible attempt to reduce an incarcerated inguinal hernia. The inguinal canal was wide and completely empty. One could feel at the end of it a stretched band, representing as shown during the operation, the spermatic cord pulled upward and outward by the sac which was lying in the retroperitoneal tissue a short distance above Poupart's ligament, and was slightly marked by an insignificant elevation of the abdominal wall above it. A longitudinal incision was made above Poupart's ligament, and it was found that the sac was pushed upward, making an acute angle at its attachment to the internal ring, the latter being displaced backward toward the peritoneal cavity and allowing in this way the sac to slip in an upward direction behind the peritoneum. The sac was closed by suture and removed. The patient had a good and speedy recovery.

PAGE 91.

Dr. Erskine Mason narrates the following case of interstitial hernia with a lacerated neck of the sac.

A man, aged fifty-five years, and single, gave a history of having first suffered from hernia in 1863, while in the army, and after lifting heavy weights. He had kept the hernia up part of the time with a pad and bandage, and lately had worn a truss, which was inefficient. On Saturday morning he was

taken with diarrhœa, and after he had had three or four movements, his hernia came down and he was unable to reduce it. He suffered great pain in the region of the hernia, went to the station-house, and from there was sent to Bellevue Hospital in an ambulance, where he arrived at about three o'clock in the afternoon. The house surgeon said that he was not at that time suffering from the symptoms of a strangulated hernia. On examination, however, an incomplete hernia was found in the right iliac region about the size of an orange, which he tried to reduce by taxis, but failed. The patient was then placed in a hot bath, where he remained thirty minutes, after which a hypodermic injection of morphia was given, when the house surgeon again tried taxis, as also did other members of the staff, and the manipulation was kept up for about fifteen minutes. The mass then began to recede at once from the inguinal canal, and at the same time the house surgeon noticed the development of a tumor of about the size of that to which taxis had just been applied, and dull upon percussion above and outside the internal ring. A bandage was applied, and a stimulating enema was given, which produced no movement from the bowels. On the following morning, the man complained considerably of pain, and it was found that the hernia had again descended. Taxis was applied, and the tumor ascended as it had previously done, but vomiting supervened, pain returned and radiated over the abdomen. At five o'clock in the afternoon Dr. Mason saw the patient, and found him much prostrated and suffering from severe pain in the abdomen, which was somewhat tympanitic. He found a swelling in the region above the internal ring, with slight fulness in the inguinal canal. By forcing the finger into the canal, and at the same time pressing upon the tumor from above, he could just reach the coil of intestine.

The patient was put under the influence of ether, and Dr. Mason proceeded to operate. The sac contained a good deal of

fluid, but it did not have a bad odor. At the neck of the sac a small knuckle of intestine was found, which was quite congested. He divided the neck of the sac and then proceeded to press against the intestine, when he found that it did not recede into the abdominal cavity. He drew the intestine down, but could not push back the part which protruded. The finger was then swept around the intestine, and in the posterior part of the neck of the sac a rent was found, which had permitted the coil of intestine to escape into the subperitoneal tissue, from whence it was gently drawn and readily passed into the abdominal cavity. The edges of the sac were united with catgut sutures. No unpleasant symptoms had followed the operation. The incision was made directly upon the cord, and the inguinal canal was opened. A drainage-tube was placed to the outside, and about the neck of the sac. The method of closing the sac with catgut sutures was one adopted by Mr. Southam, who had reported in the last number of the *Lancet* six cases in which it had been practised successfully.

PAGE 92.

The following case of *intermuscular* or *intraparietal* hernia reported by Dr. George F. Shrady, of New York, is interesting not only on account of its rarity, but also from a clinical point of view.

The patient was a Scotchman, fifty-four years of age, whose left testicle had not descended until he was twenty-two years of age. When four years old he fell over an embankment, since which time he dated the occurrence of a hernia in the left groin. After the descent of the testicle the hernia appeared in the scrotum also. During the greater part of his life he had worn a truss and suffered no more than the ordinary inconveniences attending a reducible inguino-scrotal hernia. About one year ago he had difficulty in returning the hernial contents, and suffered

from temporary strangulation. On the 4th of last December, while waiting upon a customer, the hernia came down, and the patient was unable to reduce it as formerly. Symptoms of strangulation soon after appeared, and Dr. F. W. O'Brien, of Harlem, was summoned. Failing in accomplishing the desired result by taxis, Dr. O'Brien advised an immediate operation. The patient would not consent to this measure, and determined to trust to the chances of his own efforts.

Four days afterward Dr. M. J. Roberts was called in to see the case, and also proposed an operation. The patient consented to have taxis tried under ether, but exacted a promise from Dr. Roberts that no cutting operation should be performed. The patient awoke from the anæsthetic with the strangulation under-reduced. The following day I was called upon to perform herniotomy. The patient was at that time in the fifth day of strangulation, had an anxious expression, feeble, thready pulse, cool surface, and was constantly vomiting stercoraceous material. The hernia was situated on the left side, and presented some striking clinical features. The swelling, which was equal in size to a largely distended colon, extended continuously from above the anterior superior spine of the ilium to the fundus of the scrotum. The overlying tissues were tense, particularly those of the scrotum, and there was considerable tenderness over the external abdominal ring. The unusual situation and the peculiar shape of the tumor suggested at first the possibility of reduction *en masse*. The existence of such a condition was, however, disproven by careful examination, and by the assertion of the patient that the swelling had been there as long as he could remember, and that it was almost invariably larger after a hernia in the scrotum had been reduced.

Percussion gave superficial intestinal resonance throughout the entire extent of the tumor. Inasmuch as the swelling extended above the line of the internal ring, contained intestine,

and was apparently situated in the substance of the abdominal walls, the diagnosis of intraparietal hernia was made. The existence of the supplementary sac was believed to be due either to a previous rupture laterally of some portion of the vaginal process of the peritoneum, and the subsequent formation of a cyst around the escaped intestine, or to a true diverticulum of the peritoneum. It was proposed to cut down in the usual situation, over the external ring, divide the stricture wherever it might be, and, if possible, reduce the contents of both sacs. But the patient again refused the operation. This was on Thursday. On the following Sunday, by request of one of the patient's family, Dr. O'Brien called Dr. Ripley in consultation. That gentleman, recognizing the urgency of the symptoms, advised immediate operation, but to no effect. To my surprise I learned that the patient was still alive on the eleventh day after the commencement of symptoms of strangulation, and that he had finally consented to an operation. He had been in the meanwhile very much reduced by constant vomiting. When I saw him at that time, in company with Drs. O'Brien, Roberts, and John Shrady, he was evidently fast sinking, and it was decided not to take the chances of the patient dying during an operation. The site of the hernia was infiltrated, ecchymosed, and œdematous. This condition was assumed to be due to sloughing of the strangulated gut, and the discharge of its contents into the surrounding areolar tissue. The patient died shortly after my visit.

The autopsy was made the day following, by Dr. W. H. Porter, who verified the diagnosis which had been made before death. The tissues of both the groin and scrotum were immensely thickened by fecal infiltration and resulting inflammatory processes. At the seat of constriction, which was the external ring, the walls of the gut had sloughed entirely through on one side and partially through on the other, allowing the escape of fecal fluids into the adjacent tissues. The hernia was

of the congenital variety, the sac being formed by the vaginal process of the peritoneum. Continuous with this sac, was a diverticulum of peritoneum, seven inches long, extending from the inguinal canal upwards above the anterior superior spine of ilium and between the external and internal oblique muscles. The diverticular sac contained several knuckles of ilium, which had found their way thither through the enormously enlarged internal ring.

As previously stated, this form of hernia is rare. So far as can be learned from the meagre literature upon the subject (as contributed by Birkett, Bryant, Klebs, Hartung, and Lenhart), intraparietal hernia is associated with the congenital variety, and is probably due to the existence of a congenital diverticulum of peritoneum in the inguinal canal. In this particular instance, the left testicle remaining in the inguinal canal until the twenty-second year may have been an important factor, if not in the actual production of the diverticulum, at least in its early development. It is quite probable that the hernia produced at four years of age was in the diverticulum, the undescended testicle virtually plugging up the inguinal canal. Up to the time of the descent of the testicle, the intraparietal sac was being constantly stretched, as was also the internal ring. When the testicle descended, the vaginal process of the peritoneum remained open, and of course formed the sac for the congenital hernia.

The clinical features in this case are of great importance. The principal interest centres in the possibility of making a correct diagnosis. In the present instance this was not difficult, owing to the history of the case and the general appearance of the swelling. The tumor was of long standing, it extended external to and above the internal ring, it contained intestine, and was quite superficial. The treatment in case of strangulation would, as in the present instance, involve the consideration of

possible stricture either at the external or internal ring, or within the diverticulum itself. If by any chance a diagnosis of the condition of the parts is not made in such cases, it is easy to understand how a herniotomy for strangulation might result in confusion to the operator, and in his possible failure to save the patient's life.

15 PAGE 94.

"But why operate at all? This will at once be propounded by many conservative practitioners, especially in the light of present medical teaching. There are many and sufficient reasons in my opinion.

"A patient with an infirmity of this character is imperfect, and the consciousness of it, if not always depressing, is at least very annoying. The wearing of a truss is an inconvenience of which many would gladly rid themselves. Some persons, again, cannot satisfactorily be fitted with a truss. I know of a case in the practice of a prominent physician here, in Buffalo, where, owing to the presence of a fatty tumor, the proper adjustment of a truss is almost out of the question. A hernia unreduced or irreducible, is liable to many grave accidents, too well known to require mention. A man with this defect, no matter how slight, or what his physical condition otherwise, his social or intellectual standing, is debarred from entering the services of the United States, the Army, Navy, Marine Hospital Service, Revenue Marine, etc., which to many is a field where their tastes would lead; and if the physical examination of seamen for the Merchant Marine becomes compulsory, it will prevent many men from shipping and earning their living in that manner. Considering the large number who are defective in this respect, it becomes a serious question, and any reasonable method which can remove it, is to be carefully entertained. In the United States, there are about one in every fifteen, who

carry a hernia (Agnew); in France, one in thirteen (Malgaigne). Out of 334,321 men examined during the war, 17,296 were rejected (Agnew), and of all the varieties of hernia, the inguinal was the most frequent." — *W. H. Heath, M.D., Assistant Surgeon U. S. Marine Hospital Service.*

16 PAGE 98.

HISTORICAL SKETCH.

The first mention we find of an attempt at a cure of hernia is in Celsus (lib. 7, cap. 20); he speaks of the treatment of inguinal hernia as an operation generally known to the surgeons of the Alexandrian school, although he quotes no authorities upon the subject. He did not operate upon herniæ that were very voluminous and recommends before operating on young children, to try the effect of pressure, by means of a bandage and compress placed over the seat of rupture; a method which he says is frequently successful. His method of operating was either by ligature, or by suture, or by excision of the sac for which he gives two processes, according to the age of the patient. He did not extirpate the testicle in this operation, unless it was diseased or had adhered to the sac so that it could not be separated from it.

In the hundred and fifty years that followed Celsus to the time of Galen, we find nothing more upon the subject. Galen himself in his book, *De Tumoribus præter Naturam* (lib. vi.), adds nothing to what was already known; he simply repeats the doctrines of Celsus. Leonidas of Alexandria lived about this time; he distinguished hernia with rupture of the peritoneum from hernia without rupture (congenital hernia), and considers the latter the more difficult to cure. In the two centuries that follow Galen, to the time of Oribases, we again find nothing more upon the subject. *Ætius*, in the fifth century (lib. iv.

ser. 2, cap. 24), makes the first mention of cauterization, and prefers it to any other treatment, although allowing that a cure may be effected by astringents. We then find nothing more until we come in the seventh century to Paulus, who was the last Greek surgeon of any note. He gives with more detail the operations previously described by Celsus; in the operation by excision he recommended a ligature to be applied to the sac before the operation.

After Paulus, the northern barbarians devastated Europe, and overwhelmed science and the arts in the darkness of their destruction. The Arabians, however, still kept the light of knowledge burning; but because of their prejudice against bloody operations, they confined themselves in the treatment of hernia almost entirely to the use of plasters, using occasionally, however, the actual cautery. John, son of Serapion, was the first to teach that inguinal hernia was caused by the dilatation of the canal through which pass the spermatic vessels. He recommended cauterizing the part in order to reduce the size of the opening by the contraction caused by the cicatrix. Albucasis, in the first part of the twelfth century, warmly recommended the actual cautery (lib. II. fol. 67). He cauterized the inguinal region in the direction of the canal, but forbade opening the sac. In the interval from the twelfth century to the fourteenth, surgery did little but follow in the steps of the Arabs. It was in this period that the empirical treatment of hernia reached its height, and it was also from this time that castration became so common as to excite the hatred of the Pope.

Lanfranc in 1296 (lib. 3, cap. 3, sec. 3) disapproves of cauterization and incision and recommends topical applications. He describes, however, a method of cauterizing to the bone, after having first raised up the spermatic cord. Guy de Chauliac in 1363 (Tractat. 6, cap. 7) describes the operations in use at his time. He mentions the section of the spermatic cord, castration,

cauterization, both actual and potential, and ligature of the cord by means of a thread passed under it, then tied over a small piece of wood and tightened every day until the parts were divided. He preferred the potential cautery by means of arsenic, and states that he had seen his master, Petrus de Bonanti, perform the operation successfully more than thirty times. From the sixteenth century to the nineteenth, the cure of hernia consisted almost entirely in compression and rest, and it was during this period that Blegny (*L'Art de Guérir des Hernies*, Paris, 1676) invented the elastic truss. — *From Henry Bryant's Essay.*

The intelligent reader will at once perceive that these older operations were by no means calculated to accomplish the cure which they pretended, for the attention of the surgeon in olden times was directed solely to the external ring, the anatomy of the internal one not being understood at that time. Therefore, supposing that the descent of the viscera into the scrotum were prevented, no provision was made against its further appearance in the groin. To account for the frequent recourse to these painful and dangerous operations, we must suppose that the trusses then in use were totally inadequate to sustain the hernia within the abdomen. This supposition is strengthened by the declaration of Arnaud, "that when he was appointed truss-maker to the Military Hospitals of Paris, the storehouses belonging to those hospitals were filled with trusses which it was impossible to use, because they were of only three different sizes, and contrived for only one kind of rupture." We may also form some idea of their inefficacy by the description he gives of his own instruments, the construction of which he tells us was remarkably perfect, although in fact they were of the most imperfect design.

17 PAGE 98.

The following medication, taken from Julius Cæsar Claudius, will give a better idea of the extent to which quackery was carried:—

R Terra sigil.	
Mummie.	
Sang. drac.	
Sang. humani,	a. a. 3 vi
Bol. arm.	
Litharge.	
Oppoponcis.	
Galba,	a. a. 3 iiss
Nucum cupressi.	
Nuci musci,	a. a. 3 j
Moschi,	3 ss
Ros. rub.	3 ij
Thuri,	3 ss
Cort. thuri,	3 iij
Sarcollæ,	3 iiss
Acaciæ.	
Balnas.	
Costic, gran. consol, maie et min.	
Sang. hirci,	a. a. 3 j
Pil. lopori usti.	
Pellis ejusdem.	
Pilæ erici,	a. a. 3 j
Gall tapsi barbati,	3 iiss
Picis Hispan.	
Gummis elemi,	a. a. 3 j
Mastiches,	3 iiss
Consol mediæ,	3 ij
Gum Arab.	3 j
Tragac.	3 iiss
Gypsi.	
Sang. vesperillii,	a. a. 3 iij
Myrti,	3 iij
Pici græcui,	3 ss

M. et pul. pulveris ac gum in acete, dissolv. cum ol. abiet. Ft. ceratum.

Fabricius ab Aquapendente said : "The operation for hernia is so dreadful and dangerous that, although many escape, many nevertheless die under it, or soon after ; whence it happens that surgeons undertake to cure these patients as desperate cases. On which account I have always been of opinion that patients ought on no account to expose themselves to this danger, especially being able to wear the truss during the whole of their life without the risk of shortening it a single day, which advice I gave the more willingly as conversing lately with Horatio Norsia, an operator very skilful in this matter ; he told me that formerly he had every year operated on more than two hundred patients, and that at present he scarcely operated on twenty ; and he replied to me on my asking the reason, because many cured themselves by wearing a truss and applying stringent applications."

18 PAGE 99.

Albucasis, Avicennes, Roger, Brunnes, Theodoric, and Guy de Chauliac preferred the actual cautery, while Jean de Crepatis, André de Montpellier, and Pierre d'Orliat, the potential. After the eschar was formed, the surgeon scarified it to the bone, and then made another application in order to penetrate to the bone. After the second eschar had formed, the wound was made to cicatrize.

One method of cauterization, viz., by causing ulceration of the coverings of the hernia by the use of sulphuric acid, was so famous in England, in the latter part of the eighteenth century, as to induce George I. to bestow knighthood upon Little John, an impudent quack, and to give him £500 yearly as a reward, and in addition £5,000 for his secret nostrum. It was this operation which caused the death of the celebrated Condamine. In 1773, the Académie Royale de Chirurgie unanimously condemned the pretended method of cure.

19 PAGE 99.

It was performed even as lately as 1832, when M. Larrey read before the Académie des Sciences an unfavorable report upon an operation proposed by M. Bertrand, of incising the sac, and then filling its cavity with lint to excite inflammation.

20 PAGE 102.

In 1710, Hooper was sent to the galleys for operating by castration; and a woman in Rheims was publicly whipped in 1735 for the same offence. Most surgeons will, however, be surprised to learn that it was practised in France even as late as the beginning of the nineteenth century. Such, at least, was the case in 1796, when Sabatier published his *Operative Surgery*, although a law had been passed as early as 1730 making it felony to practise it. In the report made to the Royal Society of Medicine, in 1779, by Poultier de la Salle and Vicq d'Azyr, the Chief of Parisian Police states that a large number of the recruits inspected by him before entering the army had lost one or both of their testicles by this operation; and the Bishop of St. Papoul found in his diocese that five hundred had been similarly mutilated.

21 PAGE 103.

Grafé's Operation (described by Dr. Raw, Berlin. Thesis 1813). An incision being made through the integuments, the sac is dissected from the cellular tissue, raised with a pair of forceps, and cut off. Then a plug of lint rubbed with some ointment is introduced into the neck of the sac, so as not only to touch all parts of the internal ring, but even to project into the abdominal cavity. A string is attached to the plug to withdraw it when necessary. The next morning the plug is examined. If it offers any resistance, it shows that inflammation

has been set up, and should not be interfered with. In this case the plug will detach itself in three or four days, and is then withdrawn. A second plug, anointed perhaps with red precipitate ointment, is then introduced to cause suppuration of the whole internal surface of the sac. In a few days laudable pus and granulations are forming. The complete cicatrization is said to be often obtained in a month. That so barbarous and unscientific a process should be recommended by so noted a surgeon, and at so late a date, seems almost incredible. How the operation can fail to produce fatal peritonitis it is difficult to imagine.

²² PAGE 105.

Dr. Ranz (*Gaz. Tosc. della Sci. Med.*, May, 1845) attributes the want of success to three causes: "1st. That, in invaginating the skin of the scrotum in the inguinal canal, the sac of the hernia separates itself from the integuments, which then pass between it and the walls of the canal. 2d. That the invagination does not stop up the whole canal, being fixed by the ligature only to the anterior wall; the whole posterior half remains open. 3d. That the invaginated portion of the integument returns to its place, and the effused lymph is soon absorbed."

²³ PAGE 106.

Bonnet, in his memoir read before the Academy, comes to the following conclusions: "1st. The operation ought not to be attempted on old people. 2d. That it does not afford any chance of durable success in adults when the hernia is very voluminous. 3d. That in adults, when the hernia is small and the canal still oblique and of small diameter, the operation can be performed with great success; and that it is equally successful in children, whatever is the size of the hernia or the state of the canal."

M. Mayor gives the following explanation of his method of

cure: "1st. The strong tension of the skin over the opening through which passes the hernia closes it, at least for a time, and opposes energetically a renewal of the hernia. 2d. The immediate swelling of the subcutaneous fatty tissue takes an active part in the process of cure; it swells up, and as it cannot develop itself toward the skin, it is obliged to take the direction of the ring to fill the opening, and lastly to contract adherences with the adjacent parts. 3d. The inflammatory swelling which takes place in the part near the ring and in the ring itself causes adhesive inflammation of these parts. 4th. A secretion of plastic lymph which unites all the parts together. 5th. The thickening and solidification of the same lymph."

24 PAGE 129.

FIRST OPERATOR ON HERNIA BY THE METHOD OF INJECTION.

It is often extremely difficult to trace with precision the author or inventor of an operation where several make claim to be the first in the field. As I have already hinted in the Introduction, the method of treating hernia by injection may be of Egyptian or Assyrian origin, and the discoveries of Schliemann and others may yet reveal more of the early efforts in the healing art than we can now understand, since "prehistoric man was doubtless a victim to injury before he became a sufferer from disease."

It is however recorded that the operation was first tried by Desault upon a congenital hernia, but without any success, as after the inflammation had subsided the hernia returned. Velpeau conceived the operation in 1835, but did not operate until 1837 (*Médecine Opératoire*, 2d ed., vol. iv.), and then not until he had first cut down upon the parts.

On the other hand, from information which I have obtained from records and documents, and other sources I am convinced that the honor of the discovery of the subcutaneous operation and method of curing hernia by injection, belongs rightly to my esteemed and distinguished fellow-countryman, Professor Joseph

Pancoast, M.D., who operated on thirteen cases of hernia in 1836, using Lugol's solution of iodine, or tincture of cantharides. He was at that time Surgeon in the Philadelphia Hospital. *Vide* page 283 of the *Treatise upon Operative Surgery*, by Joseph Pancoast, M.D., 1844. The instrument there figured and described is similar to the one used by Dr. Heaton in his first operation, in 1840-41. *Vide* present work, page 370. Dr. Heaton experimented with Lugol's solution of iodine, tincture of cantharides, essential oils, and various other liquids; but soon abandoned these for the extract of *Quercus alba*.

In the present work I have given to Dr. Heaton the honor and credit of being the originator of the method of injection for the cure of hernia; but I am convinced that the first operator who used this method was Professor Joseph Pancoast, and to him belongs the honor of originating it. Dr. Heaton, by experimentation, found a fluid more suitable for the purpose than that used by Professor Pancoast.

In honor of Professor Pancoast, who originated the method of injection, I would therefore most respectfully suggest the propriety of calling the operation the "Pancoast Operation for the Cure of Hernia by the Subcutaneous Method."

It is a noticeable and interesting fact, however, that both Velpeau and Pancoast punctured and made their injection into the hernial sac. The student and practitioner is earnestly referred by the author to pages 149 and 206. It will be seen that the author injects not the sac, but throws his injection into the *rings* and *around* the sac. This is a very important fact, both from an historical point of view and in the successful treatment and cure of hernia.

25 PAGE 140.

I am happy to be sustained in my views upon this method of treating inflammations and abdominal wounds by so good an

authority as Surgeon Doherty, of the United States Army. In Circular No. 3 of the Army Reports, he has said that ice bags or bladders are often too intense in their effects, are painful upon prolonged contact with the part, and involve too much inconvenience for permanent and satisfactory use. *Ice poultices*, properly made, combine all of their advantages with none of their disadvantages, being safe and convenient, and producing a permanent, uniform reduction of the temperature. They cause no pain, no chilliness, no inconvenience from their weight, and admit of easy application. They do not require removal oftener than once in two or three hours, do not saturate the clothes of the patient, and require no special arrangement for their use.

Maisonneuve's directions for the application of cold are substantially as follows: Take of linseed meal a sufficient quantity to form a layer from three quarters to an inch thick; spread it upon a cloth of proper size; upon this, at intervals of an inch or more, place lumps of ice of convenient size — of a *big* marble, — then sprinkle them over lightly with the meal; cover with another cloth, folding in the edges to prevent the escape of the mass; and apply the thick side to the surface or wound. The ice is closely enveloped by the meal, the exclusion of the air retards the melting of the ice, and the thick layer, intervening between it and the surface of the body, prevents painful or injurious contact. Linseed meal is better for this use than bran or similar materials, because its mucilaginous properties render it somewhat tenacious and adhesive.

26 PAGE 140.

FIBRO-PLASTIC LYMPH.

“J. Hunter and his followers, the French surgeons, up to the present time, have maintained that this plastic lymph is derived from the vessels by exudation, is susceptible of organization, and of the formation of the different tissues met with in cicatrices.

In this grayish opalescent layer composed of lymph filaments of fibrin, there are found white corpuscles or pus cells, and red blood corpuscles. Beneath this superficial layer, the fasciculi of the connective tissue and the blood capillaries are separated from each other by the same opalescent substance, so as to constitute a kind of membrane, continuous and extremely thin. From this description, it is seen that at the moment when this so-called lymph becomes solid, it contains cellular elements. At the present time these facts might be explained by the white blood corpuscles passing out of the vessels and the coagulation of the fibrinogenic substance (Cohnheim). Yet this explanation is not sufficient, for it is very possible that the lymph contained in the lymphatic vessels, and in the meshes of the connective tissue, plays some part in these phenomena. It has been mentioned that the white or lymph corpuscles are found free between the fasciculi of the connective tissue. Again, the conditions for the formation of fibrin are far from being perfectly understood. It is only known that the plasma of the blood, abstracted from the vessels, coming in contact with the paraglobulin (Kühne), and other substances contained in the histological elements, takes the form of fibrin. What is difficult to understand is, why the blood plasma, lymph, and serum of the pericardium, which contain the fibrinogenic substance, never give origin to fibrin in the living organism, although these fluids are in contact with elements containing the fibrinoplastic substance.

“The infiltration of connective tissue by a notable quantity of round elements can generally be recognized only with the microscope. In this peripheral zone there are very manifestly seen a swelling of the flat cells of the connective tissue, a division of their nuclei, and a consequent proliferation of these cells.

“From this description it is seen that the abundant production of new cellular elements, between the constituent parts of the

connective tissue, may come from two sources; the passing out of the white blood corpuscles, and the multiplication of the cells of the connective tissue.

"Cornil and Ranvier."

PAGE 143.

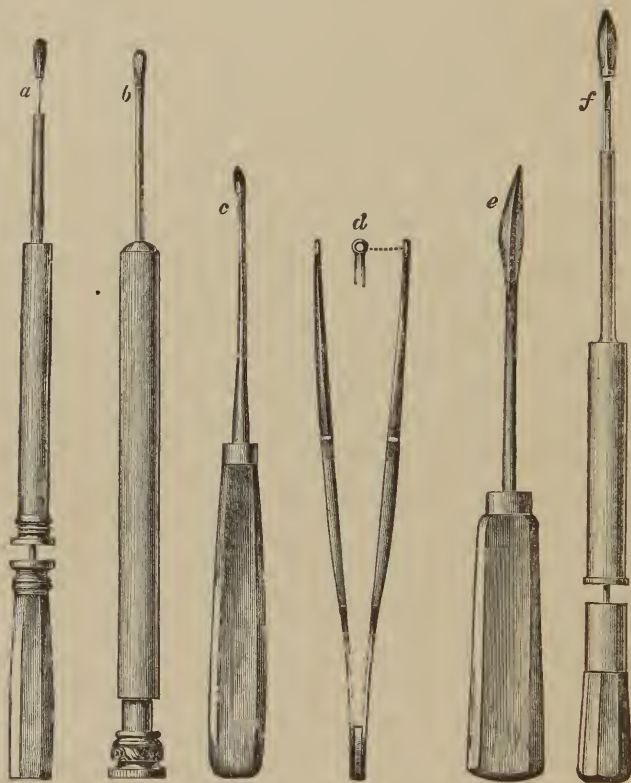


FIG. 80. — HEATON'S CASE OF INSTRUMENTS.

- (a) — Instrument for injecting the solid extract of Oak Bark, which he seldom used.
- (b) — Syringe for injecting the fluid extract of White Oak Bark, by which he effected the most of his cures.
- (c, d, e) — Instruments used in the operation of varicocele.
- (f) — An instrument which acted as a scarificator, and at the same time was used to introduce the solid extract.

27 PAGE 148.

HEATON'S FORMULA.

R	Fl. Ext. Querci Albæ	℥ j
	Solid Ext. Querci Albæ	gr. xiv
	Morphl. sulph.	gr. ij
M. Sig. Inject 8 to 10 drops.		

The following formulæ I have devised, and find to be the very best for injection :—

FORMULA A.

For infants and children, whether the hernia be accidental or congenital :—

R	Fl. Ext. Querci Albæ	℥ ij
	Reduced by distillation to	℥ j
	Alcohol 70%	℥ ii
	Ether. sulph.	℥ i
	Morph. sulph.	gr. ss
M. Sig. Inject 8 to 10 drops.		

FORMULA B.

For old and long-standing hernæ in adults, whether congenital or acquired, I used the following in my first operations :—

R	Fl. Ext. Querci Albæ	℥ iv
	Reduced by distillation to	℥ j
	Alcohol 90%	℥ iii
	Ether. sulph.	℥ ij
	Morph. sulph.	gr. ij
M. Sig. Inject 10 to 25 drops.		

FORMULA C.

The very best formula, however, which I have ever used is the following. It is the one I now recommend for most cases in the adult person.

R Fl. Ext. Querci Albæ	3 vi
Reduced by distillation to	3 ij
Alcohol 90%	3 ss
Ether. sulph.	3 ij
Morph. sulph.	gr. iv
Tr. Veratri Viridis	3 ij
M. Sig. Inject 15 to 20 drops in small and recent herniæ, but 25 to 50 drops in large or old herniæ.	

Of this irritating mixture, we can use a much larger amount than of any other I have ever used, and with more impunity. I have often, during the past year, injected large doses without forming any local suppurations or abscesses. In one case I had a very slight superficial irritation of the size of a pea, such as we often see after the hypodermic injection of fluid extract of ergot. The greatest advantage, however, in the formula is that we get a very marked reduction of pulse and temperature, which often comes on so suddenly that we have to apply a bottle of hot water to the patient's feet. This reduction may last as long as forty-eight hours, thus giving us a decided advantage during the very period in which we most desire to keep down the temperature, and allowing us to gain a more decided local effect of our irritant. It will be readily seen also that nearly all, if not quite all, of the ingredients used are antiseptic in their action; so that we may claim, in addition to the simplicity and all the other advantages of the subcutaneous method of treating hernia, the peculiar advantages of the antiseptic methods that have been mentioned.

28 PAGES 149 AND 205.

OPERATION BY INJECTION.

The operation by injection, as described in many text-books of surgery—even the most recent,—has been thus strangely misunderstood. See also page 367. By injecting the hernial rings, the effect is very different from what it would be if the

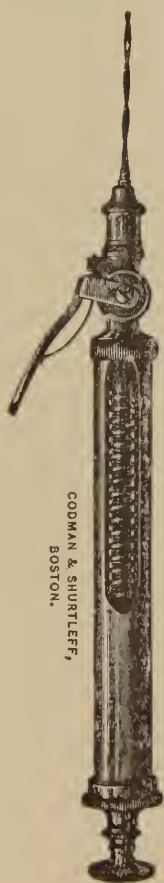
irritant were introduced *into the neck of the sac*. In the latter, it would simply act upon opposing serous surfaces and produce an effusion of serum or sero-purulent matter. A portion of such effusion, it is true, might consist of lymph, and cause the opposing surfaces of the sac to unite by adhesions with more or less apparent organization. The persistency of such a result, however, would be very uncertain, and it could scarcely terminate in a trustworthy cure of the hernia. For if these adhesions should not soon diminish or disappear by absorption, the protrusion,

if it could not re-enter the old sac, would sooner or later force down a new one through the still undiminished or even gaping fibrous opening. This was long ago pointed out also by Lawrence in his able treatise *On Ruptures*. On the other hand, the lymph produced by the injection *into the rings* "has a natural tendency to organize into tissue similar to that which gave it birth, thus thickening by interstitial formation the whole series of fasciæ, contracting the rings both directly and indirectly." See also pages 129 and 381.

29 PAGE 157.

MY NEW INSTRUMENT.

Being desirous of having a lighter and less complicated instrument for performing the operation of subcutaneous injection, I have devised the instrument here figured. This was made for me by Messrs. Codman & Shurtleff, of Boston, and by Milliken & Down, of London. It is equally as effective as the one figured and described on page 157, and is not a quarter part



CODMAN & SHURTLEFF,
BOSTON.

FIG. 81.

as expensive. In general appearance it is similar to my first syringe (figured on page 144). It has a valve by which we can control the fluid; the head of the needle revolves on a ruby, and a spiral spring upon the piston within the barrel forces the plunger down upon the fluid, ejecting it through the valve. A screw on the piston, similar to that seen on the common hypodermic syringe, regulates, with great certainty, the number of drops of fluid we wish to use.

This is my latest device, and it is very much lighter, and more fully under control of the operator, than any of my previous instruments.

30 PAGE 167.

BANDAGES.

To facilitate the operation still more, I would present to your attention the following remarks upon bandages, since bandages and compressing pads are a very important factor in obtaining our satisfactory results. It will be found that a strong elastic bandage, or, still better, one of pure rubber, will be of very great advantage in maintaining perfect compression of the parts during all of the treatment. Such a bandage does not slacken by stretching, as does ordinary cotton or linen cloth. It should not be drawn very tight for the first four or five days. After this time, if the swelling and inflammation be not too great, the bandage may be tightened so as to compress a little more severely, but not enough to give rise to much pain or discomfort.

We should always remember that pressure is of the greatest importance in obtaining a successful issue in many operations, and particularly in this operation under consideration. Nothing can equal this rubber bandage for obtaining a firm, but gentle, pressure.

This bandage, when pure rubber, should be 6 or 8 feet long, and 3 or $3\frac{1}{2}$ inches wide, and of the thickness usually in use.

It can have a tape attached to one end, sufficient in length to pass around the body and be tied above the symphysis pubis in a bow knot. Before applying the bandage I usually apply a thin piece of coarse cotton or linen cloth next the parts, to absorb perspiration and give a more agreeable sensation than the clammy rubber would give. In adjusting this rubber bandage we can, by passing the fingers beneath it, judge the amount of pressure proper to apply. This same equal pressure can be constantly maintained, as we pass the bandage around the body twice or thrice.

The elastic webbing is too thick and bungling to be adjusted well, so that I have abandoned its use in these operations. I prefer that the perineal bandage should be made of cotton flannel, as it is much softer than linen. Those who prefer linen, however, will find that a little cotton rolled within it will make it far easier to the patient.

The head of this bandage should be fastened over the trochanter and brought not too spirally around the hip, and fastened by passing it under the rubber bandage, and bringing the end over to make a loop, that can be pinned in front by the ordinary safety pins. It should not be drawn so tight as to narrow or contract the rubber bandage. A linen napkin, folded so as to be about three or four inches wide and forming a compress about one half an inch in thickness, will be found to make a satisfactory compress.

31 PAGE 210.

Another method has been devised and successfully applied to irreducible herniæ by my distinguished friend J. Collins Warren, editor of the *Boston Medical and Surgical Journal*, Instructor of Surgery at the Harvard Medical School and Surgeon at the Massachusetts General Hospital. His plan is to use a "rubber water bag externally inelastic, but containing an elastic lining

inclosing a space to which water or air could be admitted by a tube." To this a stout T bandage is sewed to secure it in the scrotum. When once buckled in place, the bag is pressed firmly down upon the pillars of the ring by thick wooden pads. Water may now be forced in at any desired pressure, and continued for any length of time. It is indeed a great improvement over the simple rubber bandage devised by Maisonneuve. If uniformly successful, it will give us a fair prospect of relieving many cases hitherto incurable, except by the more serious operations of herniotomy, because, manifestly, if herniæ hitherto irreducible may be reduced, they will then be subject to the same conditions of treatment as the reducible.

32 PAGE 217.

M. Seutin, the eminent surgeon of Brussels, made some experiments in 1856 to establish the superiority of tearing either the inguinal or crural ring, over the operation of incising the same for the reduction of strangulated hernia. He made experiments on the cadaver, and had several successful cases in practice. He places, first, great reliance on graduated taxis, continued with due precautions, for a considerable period; when this fails, he endeavors to hook his index finger around the margin of the ring by passing it between the tumor and the abdomen; by using a certain amount of force he then causes the fibres of the external oblique to give way and tear to an extent sufficient for the reduction of the hernia. The method is a good one in many cases.

The operation for strangulated hernia has been known only since the time of Rousset. Maupasius seems to have been the first to demonstrate its advantages. Aymar and Formi, however, had recourse to it with success in the sixteenth and seventeenth centuries. Up to that period kēlotomy had not been performed except for the radical cure of hernia.

33 PAGE 221.

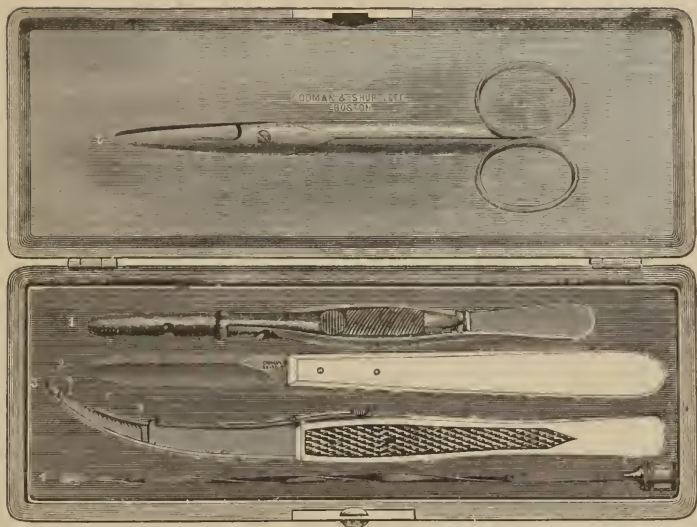


FIG. 82 — Author's Herniotomy Case. 1. Golding Bird's Torsion Forceps. 2. Scalpel. 3. Author's Herniotomy Knife 4. Author's Aspirating Needle. 5. Scissors.

34 PAGE 221.

Günz, Camper, Louis, Hevermann, Callisen, Bell, and Wilmer paid little attention to the epigastric artery, and said that the fears of surgeons of wounding it in dividing the inguinal ring were vain and ill-founded. Upon this point Bertrandi says, "I can affirm that I have opened the bodies of men who have died a few hours after this operation (speaking of the incision of an incarcerated *inguinal* hernia), although performed with great facility, dexterity, and quickness, so that the operators thought highly of themselves on that account; and they were quite astonished, and could not comprehend the cause of so unexpected deaths; but their astonishment ceased when they saw the abdomen full of blood discharged from this artery (*epigastric*) wounded."

On the other hand, surgeons were not ignorant, even before

the time of Arnaud, that the incision of Poupart's ligament, to free *femoral* hernia in the male from strangulation, was a very dangerous operation. They supposed, however, that the danger here was also in injuring the epigastric artery, but Arnaud was the first to point out the important "fact that in the male the spermatic cord passing over the neck of the hernial sac in a semicircular manner, and running immediately behind the margin of the ligament, was much more exposed to the injury than the epigastric artery in either sex."

CHAPTER XV.

RÉSUMÉ AND CLINICAL REPORTS.

WE said in the first edition of this work that we could not then in all truth and candor give so systematic and conclusive results of our operation as we could desire, but hoped to do so in some future edition. From the very many successful cures that have since occurred, both in the author's practice and in the practice of many most trustworthy and conservative gentlemen in the profession, we are confident and happy in saying that we can now give even more favorable reports than we then anticipated even with our most buoyant expectations. If any, however, should prefer some other operative measure rather than the painless subcutaneous injection, he will, I think, find it clearly described in the preceding pages.

I am fully convinced that the grand and essential reason why the injection method succeeds so uniformly in attaining a permanent cure of hernia, while all other methods have more or less failures, is that it gives us local inflammation about the rings and canal, but *no tendency to suppuration*. Suppuration, as I have already said, weakens the surrounding tissues and prevents their consolidation. This weakening influence is also seen in the tendency that abscesses in the groin have to produce a relaxation of the fibres about the rings, and consequently a hernia. The reader will remember that in my first two or three cases I did have slight suppurations, and said at the time that

I feared the result of the operation would, on that account, not be a successful one; but from the time that I have used my new combination of fluids, I have had not even incipient signs of suppuration, and *therefore* I have had uniform success.

Just so far as an operation for hernia tends to produce suppuration, just so far will it be ineffectual in attaining a cure. On the other hand, let inflammation *without* suppuration be set up, and we shall produce a contraction and consolidation of tissue. The principle of this theory may perhaps be illustrated by the consequences of a burn or scald upon the skin. Wherever the injury has been so severe as to produce suppuration, we do not get a contraction and distortion, but only a deep and smooth cicatrix. Where, on the other hand, we do not have abundant suppuration, but only a serous exudation, we get the contractions and distortions that require much surgical skill to remove successfully. The same principle, in another phase, is seen in tenotomy; when we have not thoroughly and completely divided the tendons and fasciæ covering the muscles, we shall be sadly disappointed in the results of our operation, for instead of relieving the traction we have increased it, because we have irritated, and hence *inflamed* the fibrous structures. The operation for strabismus often fails, too, for the very same reason, — failure to divide the fasciæ of the muscles.

It will thus be made evident that I maintain that the operation for hernia by injection is successful not because it produces tendinous irritation *simply*, but because it produces *both tendinous irritation and local inflammation without suppuration*. This is an important distinction, both as regards the theory and also as regards the practical success and permanence of the operation. All other methods have accepted and expected suppuration as an accompaniment of the operative procedure, and have not been disappointed when they obtained it. This method avoids suppuration, as it would every other unfavorable complication.

Other methods cannot avoid suppuration; this method can and does avoid it, when properly performed, and with the proper fluids. The value of the various antiseptic methods and ligatures in treating hernial protrusions is, then, simply that they make an attempt, however successful, to avoid suppurative inflammation.

As regards the fluids that have been used for injection, it may be said that it is altogether probable that many have failed because they were absorbed before they had produced the inflammation necessary to produce consolidation. Some have supposed that the chief value of *Quercus Alba* lay in its power of producing contraction of the tissues by virtue of its astringent properties.

Probably oak bark is *specific* in its action, but it acts chiefly, not by contracting tissues and blood vessels, although it may do this in a measure, but *by refusing to be absorbed readily*, and by remaining in the tissues until the stimulation and irritation set up by it, the alcohol, and the ether shall have produced an inflammation that shall compel the tissues to consolidate. This is readily proved by the fact I have often mentioned, that when I have injected the superficial integuments around the rings, the dark appearance and consolidated structure will remain for months, and even years. It also offers an additional reason for “reinforcing” these tissues as I do, to sustain the rings, and act as a constant compress. *This specific action is the reason why this operation does not have recidive more frequently.*

For the benefit of any who wish to perform this operation, the following concluding observations are given.

In small herniæ or bubonocœles occurring in patients from four to twenty years of age, who otherwise enjoy good health, an injection of iodine, sulphuric ether, alcohol, oak bark, or, as one surgeon writes me, of sulphate of zinc — fifteen grains to the ounce of water — will generally effect a cure, if all the directions

I have given are carefully followed out in every particular. In very large herniæ, or those of long standing, the cure will be more difficult of accomplishment, and we cannot expect a permanent cure so confidently as in the simpler cases of small and recent herniæ. The cure can be accomplished only by impressing upon both the patient and ourselves that the action of any fluid we may elect is only the primary step in the operation; remembering that with a stimulating fluid we are hastening, with some degree of certainty, what might take place more slowly under the wearing of a proper truss. See page 321.

These large and old herniæ may require several injections before we effect a cure. The injections should be repeated once in three to six or eight months, or upon the least signs of any weakening of the parts. As soon after the operation as possible a good truss of steel, or an elastic bandage with proper pads, should be applied. This should be worn constantly while in the upright position. The patient should wear a truss, and remain under our observation for a year or more, and be carefully examined from time to time, so that successive irritation and inflammation of the parts may be made, if necessary, either by gentle pressure or by a new injection if needed. If we treat our cases with judgment, taking all possible care and pains, we shall by perseverance be rewarded with the cure of many unpromising cases; but if, according to the method of one operator, we inject only a *little* fluid, use only a *cloth* bandage and discharge the patient as cured after a few days have elapsed, we shall be most certainly disappointed. I feel warranted in saying from my experience, that if our operation be successful in keeping up the hernia for a period of six months, we may have great hopes that adhesions have formed so firm and solid that they will, as is shown on page 199, continue to grow more firm and consolidated.

As I have already said upon page 175, I have exercised great

care in the selection of my patients; I have not endeavored to see how many cases I could operate upon, but I have all the time been careful to see both how much can be done in the way of effecting a permanent and trustworthy cure of hernia, and how much we can reasonably expect of the method of subcutaneous injection in effecting this desired cure. I have therefore rejected many cases which might possibly have been cured, but upon whom I thought the operation of injection would not be markedly successful. I have done this for three reasons: because some of the patients were aged or in poor health; because others had been ruptured so many years that even with our improved method, mentioned below, we could hardly hope for success; and, finally, because some of the patients did not seem sufficiently intelligent to appreciate the importance of the after-treatment, and the fact that the greater part of our success really depended upon them in obeying our instructions most implicitly.

On page 180, I have said that I hoped at some future time to develop a method of operation which should give us a better success in the case of old and large rings which have become fused into one, and which produce little exudation of plastic lymph. I have fulfilled my expectations much better than I then could even hope. In the first place, I can inject much more of my new injecting fluid (see page 372), on account of the tincture of *veratrum viride* that is in it, while by the strong rubber compress (mentioned under Bandages, page 374) I can keep the parts in close apposition, for a time varying from three to thirty days, until adhesions take place sufficient to bind the fibres of the rings together. In the second place, to persons of great obesity, and to those who have herniæ not easily retained, I apply a piece of elastic rubber tubing, some five or six feet long, just below the hips, after the method of Esmarch in his bloodless operations. After tying it tight around the groin, I

roll it over the abdomen, pressing upward thereby all loose tissue, together with the peritoneum and hernial protrusion, so that they are out of harm's way during the operation. I have found this arrangement convenient both to the patient and to the operator, and it has enabled me to undertake cases with confidence that I should previously have rejected or accepted only with hesitation.

I have said already many times, and I now finally repeat, that we cannot foretell with certainty what success may attend our efforts to effect a cure; we can only wait upon and assist nature. If, then, we ourselves can only hope, but cannot know what will be the result, it is very unprofessional, and savors of the charlatan, to assure any single one of our patients that we can certainly cure them. On the other hand, it is likewise as unreasonable that patients should expect us to give such positive assurances.

No surgeon, even in the operations that have been performed from time, I was about to say, immemorial, would venture to say more than that some operation seemed to be necessary for the patient's happiness, or even life, and that this or that operation in the surgeon's candid opinion was the best one to be employed. Yet in the cure of hernia, patients seem to expect us to "warrant a certain cure without failure;" and, stranger still, physicians of good standing can be found who will not only promise such a cure, but who seem to praise faintly an operation which will not allow of such rash assurances.

All of my patients, at least, clearly understand before I operate upon them that this is my position, and that I will never in any case of operative surgery, no matter what it be, *guarantee* a cure. That, however, I have the greatest confidence in the operation and its value the following cases will show; according to their record, it has been found by actual calculation that 92 per cent of all operated upon have resulted in positive and permanent

cures. Out of about one hundred and fifty-six cases reported and well authenticated, there have been only twelve failures.

It will be seen that I report only cases of genuine hernia, and that there is no mistake about their character, kind, and severity; so that we may with confidence know just how much reliance to place upon the operation.

In my first twenty-nine cases I have already said I had some failures, and on page 199 I have attributed these partial failures to both the imperfect instrument and the crude injecting fluid. In my last cases, out of more than the same number, I have not had a single failure, — unless, possibly, in the case of a physician, upon whom I operated for a very severe case of oblique inguinal hernia, and who was suffering at the time from general debility and dyspepsia. The case was a success at the time of operation, but no very great length of time has since elapsed, so I cannot yet be confident of a permanent cure.

In a treatise on hernia like the present one, I cannot think of giving, or even attempting to give, the names of all who are now operating by the injection method, nor a full record of the cases operated on. From the reports I have from the instrument makers, that "they are hard pressed to manufacture my instruments fast enough to fill the orders for them," I should judge, however, that the number of medical gentlemen who are now employing the method is no small one, to say the least. Many of them have corresponded with me, and with some of them I am personally acquainted. I mention especially Drs. C. P. Bancroft, of Boston, Mass., W. A. Byrd, of Quincy, Ill., H. I. Jones, of Scranton, Pa., H. S. Greeno, of Kansas City, Missouri, and W. H. Heath, of Buffalo, New York, and know that they have operated successfully by the subcutaneous method.

I shall therefore give only a few characteristic cases, first from the practice of Dr. H. S. Greeno, of Kansas City, Missouri, then a few reported by Dr. W. H. Heath, Assistant Surgeon United

States Marine Service, attached to the Hospital at Buffalo, N. Y., and shall conclude the list by a few of my own which are deemed the more interesting, taken not in order but at random.

CLINICAL REPORT OF CASES OPERATED ON FOR THE
CURE OF HERNIA BY THE METHOD OF SUBCUTANE-
OUS INJECTION.

CASES REPORTED BY DR. H. S. GREENO, OF KANSAS CITY, MO.

Mr. J. R. R., Fort Smith, Ark., aged twenty-seven, November 20th, 1879, right inguinal oblique hernia, eleven years' standing; left inguinal oblique, fifteen months' standing. Unable to retain the bowel on right side with truss, and complained of much pain and suffering. Operated November 22d, on right side, with Dr. Heaton's instrument and simple extract of *Quercus alba*, with usual dressing. December 3d, dressing removed; examination indicated cure. Then operated on the left side, December 12th. Removed dressing; found left side solid. In a few days there was a slight protrusion of bowel through internal ring of right side. The patient being unable to remain longer, I introduced a few drops of the solution directly into the internal ring. On the third day applied a double elastic spring truss and the patient left for his home, being instructed not to remove the truss for sixty days. Six months after he reported himself cured, having abandoned the truss.

CASE 5. — J. B., Buffalo, Ark., aged sixty-two, direct inguinal hernia, which he was unable to retain with a truss; complained of much pain at times. Operated December 15th, 1879. Result partly successful. Operated the second time January 10th, obtaining a perfect cure.

CASE 9. — Wm. McA., Independence, Mo., age seventy-three, double oblique inguinal hernia, right side, twenty-one years; left side twelve years. Had worn truss continuously for

twenty-one years. Operated, March 24th, on right side, using fluid as improved by Joseph H. Warren in his work on Hernia, and applied rubber bandage with compress.

Usual symptoms followed; third day fever entirely subsided. On the tenth day operated on the left side. Fever and increase of temperature much less than after first operation. On the twenty-first day after first operation, removed the bandage. Had the patient stand up and cough, and let him walk about as much as he felt able. Found a very slight tumor on internal ring on right side. Applied a double elastic spring truss to be worn a month. I did not deem it necessary to operate the second time, trusting to the continuous wearing of the truss to complete a cure. At the present time the patient is perfectly cured of both herniæ.

CASE 11. — J. W. J., Kansas City, Mo., brought to me his little daughter, aged eleven, having right inguinal hernia of six years' standing. Operated March 26th, 1880; cure perfect.

CASE 14. — Mr. C., Kansas City, Mo., aged forty, left oblique inguinal hernia, eleven years' standing. The hernial opening was very large, and the protrusion could not be retained with a truss. Operated with Dr. Warren's instrument and fluid, substituting for the bandage a double elastic spring truss, after removing the wooden pads, and supplying their places with muslin folded to many thicknesses. This I found more convenient than a bandage. The elastic belt, broad front pad, and perfectly adjustable thigh straps have proved all that may be desired as a dressing, and is worn with as much comfort after the operation as any truss or bandage I have been able to procure.

CASE 15. — Mr. E., Kansas, aged twenty-five, umbilical hernia of recent standing; operated April 15th, 1880.

CASE 16. — Mrs. B., Fort Smith, Ark., aged fifty-six, left femoral hernia, six years' standing. A large and irreducible tumor, which I diagnosed as omental, and which, after several trials, I

succeeded in reducing. I then operated for radical cure, with satisfactory results.

CASE 17. — Mr. McD., Kansas City, Mo., aged thirty-six, oblique inguinal hernia of right side of sixteen years' standing. Operated April 24th, 1881; successful.

CASE 18. — Mr. C., Iowa, aged thirty-two, left inguinal hernia, twelve years' standing. Operated May 2d, 1880. On the twelfth day patient returned home cured.

CASE 20. — Dr. W., Kansas City, Mo., right inguinal hernia, nine years' standing. Operated May 20th, 1880, obtaining a cure.

CASE 30. — Mr. C. S., Kansas City, Mo., child, four and a half years old, congenital scrotal hernia right side. Operated August 23d; cure complete. Wears no truss.

CASE 31. — Mr. D., Kansas City, Mo., boy, eleven years old, direct inguinal hernia on right side. Bowel had descended into scrotum; parts were swollen, and I had much trouble in returning the hernia. Operated August 24th.

CASE 33. — Mr. McQ., Ottona, Kansas, aged forty, right oblique inguinal hernia; operated August 25th, 1880. Patient returned home on the fifth day, refusing to remain longer. The inflammation was very slight, and there was no fever. This case was not cured, owing to the very slight disturbance produced by the operation and the patient's refusal to comply with my instructions.

CASE 34. — Mrs. D., Kansas, right oblique inguinal hernia, twelve years' standing. Patient had an excess of adipose tissue. Opening quite large and hernia retained with much difficulty. Operated August 28th. Eight days after, in spite of all I could do to the contrary, my patient would return to her home, some two hundred miles from the city. I expressed my fears that the cure might not be complete without another operation. She promised to return after a few months if the operation did not prove successful. Several months after, I received a letter from her

claiming that she was not cured, and censuring me quite severely for not having made a cure. Such failures will occur in every surgeon's practice, but cannot be attributed to any fault in the operation or operator.

CASE 36. — Mr. W., Kansas City, Mo., aged fifty-two, right oblique inguinal hernia. Operated August 28th, 1880; cure perfect.

CASE 40. — F. S. H., Lawrence, Kansas, aged twenty-eight, direct inguinal hernia on right side, rings very large and could not be retained with a truss; bowel descended into scrotum, and was a source of great annoyance. After a second operation, the patient was discharged cured.

CASE 51. — Mr. E. T. P., Kansas City, aged fifty-six, inguinal hernia of fifteen years' standing. Operated January 3d, 1881, obtaining a permanent cure.

CASE 53. — Mr. B., Lawrence, Kansas, son, four and a half years old, congenital hernia of left side. Injected dilute extract of *quercus alba*; this operation failed. Six weeks after, I injected a stronger solution, using more care in the after treatment. From present indications I have no doubt as to the cure.

CASE 85. — Mr. H. H., Ellis, Kansas, aged fifty-six, double inguinal hernia, right side, sixteen years; left side, eight years. Twelve years before, the bowel on the right side descended into scrotum, since which it has been impossible to retain it with any appliance. Bowel remained almost constantly in the scrotum. The tumor was as large as a new-born infant's head. When reclining, the hernia could be reduced with much difficulty; but on resuming an erect position, the bowel would, to use the language of my patient, "shoot out" in spite of all efforts to retain it. The left side was not quite so bad. His condition was truly deplorable. He suffered much pain, and experienced a dragging sensation upon the stomach, spleen, and diaphragm. After moving the bowels freely with oil the day previous, I

operated May 22d, 1881. I found the sac on the right side adherent, and it was impossible to reduce it by any amount of manipulation. There was much thickening of the walls of the sac, so in this case it was quite out of the question to pass a needle into the rings without penetrating the sac. Either the knife must be used and the sac must be dissected away and returned within the cavity of the abdomen, or the irritant be deposited within the walls of the sac. The patient was determined to submit to an operation, life to him being intolerable in his present condition. I therefore disregarded the sac, and passed the needle through it as near the upper margin of the ring as possible, depositing at least thirty drops of the irritant within the ring, taking care that the fluid should be well distributed. Used wet compress and usual dressing. The inflammation was greater than in any other previous case, and the fever continued until the fourth day before declining. By the sixth day fever was absent and inflammation rapidly subsided. On the twelfth day, removed dressing; patient stood up and walked around, there being no protrusion of bowel. I then operated on left side. Sac was readily reduced. Had no trouble in introducing the needle; injected fifteen drops of fluid. Eight days after, and twenty days after first operation, removed the dressing and found the parts solid. Coughing and straining had no effect on the herniæ on either side. On the twenty-fifth day, patient returned home perfectly cured and much elated.

CASE 86. — Mr. J. W. H., Baldwin City, Kansas, aged nineteen, direct hernia on left side; twenty-four years old. Had varicocele and could not wear a truss. Operated May 27th, 1881. Inflammation quite severe, with much soreness. Pulse 110, but declined on third day. Case discharged cured on the tenth day.

Mrs. B., Texas, aged fifty-two, irreducible femoral hernia on right side, had been irreducible for six years; wore a truss with

great inconvenience, and more or less pain. The tumor was about the size of a small hen's egg; it was impossible to reduce it by taxis, although I made several efforts at different times, and I concluded to operate with the knife. Contents of the tumor were omental. I was obliged to remove a portion of this before I could return it into the cavity of the abdomen. I followed Dr. Heaton's suggestion of not ligating the neck of the protruding mass before removing it. The hemorrhage was slight and easily controlled by compress. This case gave me but little trouble, and the recovery was perfect, although at one time I had fears of secondary hemorrhage, and fully made up my mind that should I ever again amputate a portion of the omentum I should first ligate the neck. Six months after the patient returned home, she wrote me that she was perfectly cured.

To sum up my cases, I submit the following, which is really as near the facts as it has been possible for me to obtain knowledge. Some of my cases have failed to answer letters of inquiry addressed to them, which I take as a very good indication that they are satisfied with their treatment, or I should hear from them.

Total number of cases operated on . . .	97
Cases reported cured	91 — 93.81
Failures	6 — 6.19
	<hr/> 100.
Number reported who have abandoned the use of trusses	56

The failures were of my first cases, and were mainly from my neglect in carrying out details and giving proper attention to after treatment. I have had no failures lately, and do not now expect any in the future, as I confine myself to Dr. Warren's improved instrument and more stimulating fluid.

CASES REPORTED BY DR. W. H. HEATH, OF BUFFALO, N. Y.,
ASSISTANT SURGEON, UNITED STATES MARINE HOSPITAL SERVICE.

CASE 1. — The irritant was deposited by accident in the areolar tissue around the cord, which from pressure of the hernia had been spread out and displaced almost beyond recognition. This accident resulted in the formation of an indurated mass, occupying the site of the cord, and apparently very indolent; later it became larger with fluctuation, and was tapped, yielding two ounces of clear fluid. A second enlargement occurred, and pus was found and withdrawn. At this period, the mass was very tender and disposed to inflame, but did not; the patient left soon after with this indurated mass (about the size of an egg) occupying that region, and resumed his work as a laborer. He was a stupid, middle-aged Irishman, that had been sent to me, and had Bright's disease, which fact I was not informed of until afterwards. Singular to say, the hernia has not since descended, the mass evidently blocking the way, in part at least.

CASE 2. — G. P., aged thirty-two years, native of France, was admitted with acute bronchitis. An oblique reducible inguinal hernia was discerned of some seventeen years' duration. He consented to an operation reluctantly, and the result was a failure. The ring was comparatively large and patulous, and should have had a second wetting with the fluid; but he would not give his consent. He contributed nothing himself to aid in a successful issue in the way of lying on his back, and keeping quiet, and prognosticated in advance, that it was impossible to cure him; and he did n't care, etc. I think this had something to do with the result.

CASE 3. — E. C., sixty-one years, native of Canada, with a double reducible inguinal hernia of twenty-three years' standing, came in to have one side operated upon, and, if successful, would return

in the fall to have the other side operated upon. Left hospital apparently cured, and promised to let me know by mail if it descended again. I have not heard from him since. He was under my observation eight weeks, having been detained in the hospital with neuralgia and some abdominal trouble.

Dr. Heath says, "I think it requires more care than would at first appear, and is one of the most rational of the many methods advised. I am firmly of the opinion that it is a step in the right direction."

Simple as it all appears, it requires considerable care and dexterity; the cord, which must be pushed aside, may be displaced and in part overlie the sac, which may itself be irreducible. The direction of the canal and position of internal ring changed, the possibility of transfixing one of the pillars, wounding the cord, or entering the abdominal cavity, are all to be remembered and avoided. The attention to every detail in operating, adjusting the compress and bandage, and the after-care are so important as to largely determine the result in most cases. An hour or so, therefore, in the dissecting-room, with a long needle, would not be misspent, but would aid to familiarize a beginner with the points most important to find, or as far as possible, to avoid.

This method I have resorted to twelve times with one failure (I believe due entirely to a nurse's carelessness), and one accident where I deposited the irritant in the areolar tissue of the cord, which from pressure of the hernia had been spread out and displaced, almost beyond recognition. Nine of the cases I consider permanently cured, and two are yet under observation in my wards. All the cases were of the oblique reducible inguinal variety, eight of five years' standing, one of seventeen years', one of twelve years', two over ten years'.

In no case did I observe a single bad symptom, elevation of temperature, or pulse rate, and but little, if any, of what may

properly be termed suffering; and, with the exception mentioned, every case left my hands, after keeping them as long as I could, apparently cured. I say "apparently cured," because the standing argument against the permanency of the result at once is raised; and I cannot say positively, beyond peradventure, that they are permanently cured, for they are beyond my observation now. Two of the men I had the good fortune to see and examine some six months after, and in both the inguinal canal was closed perfectly, and the protrusion had never appeared since leaving the hospital. One of them had subjected his case to a pretty severe test, having worked as coal-heaver on a southern steamer ever since. I do not recall what kind of work the other had been engaged in; but, as he was an ordinary sailor, I do not doubt the radical cure was strongly tested.

CASES REPORTED BY THE AUTHOR.

CASE . — Mr. M., aged twenty-eight, direct inguinal hernia on right side for five years. Could not bear a truss on account of the tenderness of the parts. Operated October, 1879, using fifteen drops of Formula B. For six or eight hours after the injection, he had fever and increase of temperature to 99, pulse 80. This subsided to normal on the following day. The parts operated on were considerably swollen, and for three days compresses of cold water were applied externally and one eighth of a grain of morphia given internally once every six hours. On the eighth day, an active cathartic was administered. The opening, which before would admit the ends of two fingers, was now fully occluded. Several medical gentlemen saw the case both before and after operation. July, 1881, he is still free from hernia, and can go without his truss.

CASE . — Mr. J., aged thirty, oblique inguinal hernia on right side extending into scrotum. It had existed for six years. The opening in the rings was one inch by three quarters of an

inch. Operated on him December, 1879, with fifteen drops of Formula B. The inflammation was sharp, and extended up as high as the crest of the ileum. There was some increase of temperature for about four days, but on the seventh day the bowels were moved by a laxative and a truss applied. On the twelfth day he was discharged, cured of his hernia. I have no report from the patient himself, but have heard elsewhere that he is still free from his hernia.

CASE . — Mr. M. J., aged sixty, large oblique inguinal hernia on right side extending into scrotum. It had become strangulated. It came on while stepping down from the sidewalk, and the first noticeable symptom was pain and smarting in the umbilical region, together with considerable nausea. As he had been suffering for some time from indigestion, he did not think very much of it at the time. But the pain began to grow intense, the action of the heart became feeble, and beads of cold sweat stood upon his neck and forehead. I succeeded, in December, 1879, after considerable difficulty, in reducing the protrusion by taxis, and on the following day the tenderness and swelling of testicle had so far abated that I operated by the subcutaneous method, injecting ten to fifteen drops of Formula C. There was but little increase of temperature after the operation, but a smart local inflammation around the cord and rings. His extremities felt so cold that hot applications were made to them. In three weeks' time he returned to his office, wearing a compress, which he afterward changed for a light truss. After wearing this for a few months he abandoned it, and is now without any support.

CASE . — Mr. M., aged thirty-two, oblique inguinal hernia on right side of five years' duration, caused by rowing. Protrusion very slight. Operated March, 1880, injecting fifteen drops of Formula B. Fever very slight, and continuing three days; temperature 99, accompanied by active inflammation about the

rings. The opening in the external ring was three quarters of an inch by five eighths of an inch. It was an irritable hernia, the truss by its pressure causing pain and tenderness through all the parts, so that it could not be worn conveniently. On the fifth day, the bowels were moved by a mild laxative. On the tenth day, he was discharged, wearing a compress and bandage. He wore a truss for six months, but has been able to go without truss or support of any kind for about a year, with no signs of return of hernia.

CASE . — Mr. H., aged thirty-two, direct inguinal hernia on left side, caused by exertions as a fireman. Operated by the subcutaneous method April 8th, 1880. Protrusion very large and prominent. Opening in rings, three quarters of an inch by one inch, running to a sharp point at both ends, or diamond-shaped with greatest diameter longitudinally. Injected twenty drops of Formula B. We had an abundant effusion of plastic lymph and a perfect occlusion of the rings. He suffered but little general fever, and hardly any increase of temperature, but had an intense soreness about the rings, and a prominent swelling, which began on the second day and lasted until the sixth. On the seventh, a mild laxative moved the bowels, and on the tenth day, he was discharged cured, wearing a truss of very gentle pressure. He wore it for eight months, and since then has been without any support.

CASE . — Mr. D., aged forty, double inguinal hernia, oblique on left side and direct on the right. Been ruptured fifteen years. The ring on left side was one inch by three quarters of an inch. The right ring was one half inch by five eighths. Protrusion when in erect position was very slight on right side, but large on the left side. Operated October, 1880, assisted by Drs. H. O. Marcy and Bancroft of Boston, and my Assistant, Willard E. Smith, Medical Student. I used Formula B, which contained a little less ether and alcohol and a little more of the Fl. Ext. of

Oak Bark. On the seventh day, the bowels were moved by injection; the swelling and inflammation, which was active on both sides, had fully subsided; on the twelfth day he was allowed to rise from bed and be "about the house," wearing a bandage and compress. Both rings were perfectly occluded and the herniæ well retained. On the fifteenth day, a small superficial abscess, like that seen after the injection of ergot, appeared on the right side. This did not extend deeper than the superficial integuments. It was thought to be caused by too severe pressure of the perineal band, and it annoyed him for two or three weeks by discharging a sero-sanguineous fluid. A light double truss was then ordered, and he resumed his occupation as a finisher of microscopes. On June 30th, 1881, I examined him. He is free from herniæ, and can go without his truss.

CASE . — Mrs. T., aged thirty-five, large femoral hernia on right side. It had been strangulated some six weeks previous to the time when I saw her. Her physician was Dr. A. L. Norris, of Cambridge, Mass., who had succeeded in reducing it by taxis after great efforts. He was assisted by Dr. D. M. Edgerly, of the same city. I operated by subcutaneous method in January, 1881, using from fifteen to twenty drops of Formula C. I was assisted by Drs. Norris and Edgerly, and by Dr. E. L. White, of Somerville. The temperature never rose to 100, as I was informed by Dr. Norris, under whose care I had left her. The injection set up in the femoral canal an active inflammation, which lasted for about a week. On the fifteenth day from the time of operating she was discharged, perfectly cured of her hernia, and was ordered to wear an elastic bandage with a sole-leather pad in front, shaped like an abdominal supporter. This apparatus was devised by a gentleman who himself has suffered from hernia. I have found it very effective to apply after these operations, while the parts are sensitive, and do not bear well the compression of an ordinary spring truss. It has the addi-

tional advantage that it can be worn night and day without discomfort. On July 6th, 1881, I examined her in company with Dr. Norris, and found that she still remained free from her hernia. I would say that Dr. Norris caused the patient to cough, and bear down, and make other efforts, which satisfied us of the perfect retention and cure of the hernia. Owing to her excessively large and broad hips, I thought it would be safe for her to continue to wear the support until autumn, when she could abandon it.

CASE . — Mrs. E., aged fifty-five, ruptured at childbirth, thirty-three years ago. Very large umbilical hernia. The size of the opening was two inches by an inch and a quarter, and was of a long oval shape; the lower portion extended down into the rectus muscle. The umbilical dimple had entirely disappeared on account of the enormous protrusion, which in the erect position was nearly as large as the head of a child a year old. Operated by the subcutaneous method February, 1881, assisted by my son, C. Everett Warren. I used nearly a drachm of Formula C. I made my puncture just to one side of the centre of the umbilical cicatrix and below it, sweeping my needle around and distributing my fluid well on the outer edge of the umbilical ring.

For the first forty-eight hours the temperature and pulse were normal. At the time of operation the pulse had been reduced from 70 to 55, and it was found necessary to apply hot applications to the feet. On the third, fourth, fifth, and sixth days the pulse stood at 80, and the temperature at 99. She had a pretty smart local inflammation, and complained of considerable pain in the back, owing, probably, to the constrained position of lying upon it. There was very great curvature of the dorsal and lumbar portion of the spine, so that a large pillow could be inserted under the small of her back easily; thus her abdomen was thrown forward and presented a very prominent appearance.

She was very large, and weighed about one hundred and eighty pounds. She continued restless after the second night; morphine was given, but this producing nausea, we then gave her bromide of potassium, which seemed to be sufficient to produce the desired rest and sleep.

On the eighth day the bowels were moved by a slight laxative, and the patient was allowed to sit up in bed and to lie on her side. The local swelling and inflammation extended in a circular direction, with a radius of seven or eight inches. Compresses of cold water were applied, and on the tenth day the swelling had so far subsided that we could pass a rubber band three inches wide twice around her body, giving us an equal pressure. This compress was continued for four or five days. It was applied over the linen bandage which had already been put on. At the expiration of this time, sufficient exudation had taken place, and the vast umbilical ring was found to be fully occluded and the former hernial protrusion entirely retained. This exudation and inflammation caused a thickening of the integuments, which lasted for three or four weeks. As it gradually shrunk and contracted, the original umbilical cicatrix again made its appearance, and she has to-day as perfect an umbilical dimple as she had when a babe. She is now (July 1, 1881) able to go without any truss or bandage, and I, together with her, feel as confident that she is as perfectly free from her hernia as she was before her rupture. Entertaining such confidence, she is to spend her summer among the White Mountains, going without any support whatever. She regrets very much that she did not have a photograph of the hernia taken, to show the contrast between her condition then and her normal condition now.

It will be seen that this protrusion was one of the largest of this variety that we meet. I fully expected to have to inject several times before attaining the desired result, but by taking great pains and care at the time of operating, by distributing the

fluid as equally as possible all around the ring, I succeeded beyond my expectations in making a radical and complete cure by a single injection.

CASE . — Mr. H., aged thirty-five, oblique inguinal hernia on left side of two or three years' standing. Operated in April, 1881, with the assistance of Dr. B. O. Kinnear, of Boston, and Mr. Cox, medical student. I injected of Formula C, twenty drops. The hernial opening was very long and irregular oval, one inch by one half inch, the pillars on the outer side seemingly torn. For the first four days he had slight increase of pulse and temperature, the latter being 98.5, and never extending over 99. On the fifth and sixth days a swelling of two fingers' breadth over the external oblique, extended from the seat of operation up to the crest of the ileum. This swelling gradually subsided, leaving a hard, cord-like feeling, which diminished slowly, but which will remain for a number of months or even years. It will give him no trouble, but will be of great assistance in closing the rings and retaining the hernia. I presume it was caused at the time of operation by a small stream from the instrument escaping upon the surface of the muscle as I withdrew my instrument. I can account for it in no other way. There was no other complication, and the case made a remarkably rapid recovery.

So perfect was this, that, with the support of the elastic truss which I have before mentioned, he visited Cape Breton Island, and told me that he went over mountains and valleys, and waded through streams. After returning home, he lifted *seven hundred pounds* in weight in the office of the doctor who had assisted me, and then called upon me to show that the operation was a perfect success, and that he was cured from hernia. When we consider that all this was done within the brief space of *one month* after the time of my operation, it seems almost like a fairy tale, and would be hard to believe, if it were not well

authenticated by the physician in whose office he lifted the weight.

I myself had some reasonable doubts that such a thing could be possible, but on asking the physician found that the feat had really been performed. I think the reader will agree with me in assuring the man that he is permanently cured of his hernia.

CASE . — Dr. H., aged fifty-nine, oblique inguinal hernia on right side. Has existed more than two years. The hernia was prevented from descending into the scrotum with great difficulty and by means of a truss. Operated by the subcutaneous injection in April, 1881, using Formula C, assisted by Drs. Daniel Chaplin and son, of Bridgewater, Mass. The operation was not very painful, Dr. H. said, but the smarting of the injected fluid was "liquid fire for a minute or two." This soon subsided, leaving a throbbing sensation in the parts, which gradually passed away. The opening at the ring was about an inch and a half long by five eighths wide, and was long and irregularly oval. He had little constitutional disturbance except a rapid reduction of the action of the heart, and cold extremities to which hot bottles were applied. He was slightly feverish for four or five days, with considerable tenderness about the parts operated upon. The greatest suffering was from the constrained position of lying on his back and from considerable flatus of the bowels. For the latter he ate freely of "ginger snaps," with sufficient morphine at night to cause rest. He was able to be up on the eighth or ninth day, with a perfect retention of the hernia. An elastic truss was applied, which he is still wearing.

CASE . — Mr. W., aged twenty-one, oblique inguinal hernia on right side. Patient sent to me by Dr. G. W. Bullard, of Vermont. Operated June, 1881, using of Formula C, about ten or twelve drops. The sensation of smarting was very sharp for four or five minutes. The temperature never rose to 100, nor the pulse above 88. The local inflammation and soreness

were considerable; they were increased by my reinforcement of the external integuments, which left a prominent swelling at the time of his discharge, some twelve days after the operation. The rings were occluded and the hernia well retained. He was ordered to wear a truss for six months. One thing I notice in hernia of short duration is, that the smarting from the injected fluid is more intense, and that the amount of fluid necessary is smaller than in cases of longer standing.

CASE . — Mr. L., aged twenty-three, direct inguinal hernia for five years. Operated June, 1881, by injecting twelve to fifteen drops of Formula C. He passed through the usual phases, with the exception that his attendant, Dr. Stevens, of North Cambridge, was obliged to draw his urine for two days. On July 1, 1881, I found the rings firmly united, and the hernia retained.

BIBLIOGRAPHY.

BIBLIOGRAPHY OF HERNIA.

A.

- ABERNETHY, J. J. Inguinal Hernia. Amer. Journal Med. Sciences. Vol. XI., p. 31. 1832.
- Acret, G. S. Treatise on Hernia. London, 1835.
- Agnew, D. Hayes. Surgery. Last Edition.
- Albers, J. F. H. Pathologische Anat.
- Albinus. Tab. Museul.
- Anderson, W. System of Surg. Anat. 1822.
- Arnaud. On Hernias. 1748.
- Mém. de Chir. Paris, 1743.
- Observations sur plusieurs Hernies.
- Atlee, W. F. Case of Strangulated Hernia. Amer. Journal Med. Sciences. Vol. XXXVII., N. S., p. 275. 1859.

B.

- BALFOUR. New Mode of Taxis in Med. and Phys. Journal. November, 1824.
- Bell, B. System of Surgery. Vol. I.
- Bell, C. Surgical Observations. Part II. London, 1816.
- Benevoli. Dissertazioni Chir. Tomo I.
- Bernard, Claude. Médecine Opératoire. 1866.
- Bertrandi. Traité des Opérations. Tomes I. et II.
- Biehat, X. Anat. Générale. Paris, 1830.
- Bigelow, H. J. Inguinal Hernia (injection). Boston Med. and Surg. Journal. Vol. XLIII., p. 339. 1850.
- Billard, C. De la Membrane Muqueuse Gastro-Intestinal. Paris, 1825.
- Birkett, John. In Holmes's Surgery. 2d Ed. Vol. IV.
- Blackman, G. A. Wurtzer's Operation. Amer. Journal Med. Sciences. Vol. XXXIV., N. S., p. 292. 1857.

- Blackman, G. P. Reduction of Strangulated Hernia "en masse." Amer. Journal Med. Sciences, Vol. XII., N. S., p. 336, 1846; N. Y. Journal of Med., Vol. V., p. 367, 1850.
- Blasius, Ernst. Akiurgische Abbildungen. Berlin, 1844.
- Bleguy. L'Art de guérir des Hernies. Paris, 1676.
- Boch, C. E. Anat. des Menschen. Berlin, 1871.
- Boehmer. De Herniis Abdominalibus. 1780.
- Bonnet. De la Cure Radicale des Hernies. Paris, 1839.
- Bose. Animadvers. de Heru. Inguin.
- Bourgery et Jacob. Traité Complet de l'Anatomie de l'Homme. Paris, 1830.
- Braithwaite's Retrospect.
- Brendelius. De Herniarum Natalibus.
- Breschet, G. Considérations sur la Hernie Fémorale.
- Brugnone. Dissert. de Test. in Foetu posit.
- Brüninghausen, H. J. Unterricht über die Brüche, etc. Wurzburg, 1811.
- Bryant, Henry. Boylston Prize Essay. 1847.
- Bryant, Thomas. Analysis of 126 Cases of Hernia followed by Death. Guy's Reports, 1856. Vol. II.
- Clinical Surgery. Part III.
- Practice of Surgery. Vol I.
- Butcher, Rich. G. Oper. and Conserv. Surgery.

C.

- CALLENDER, Geo. W. Anatomy of Femoral Hernia. London, 1863.
- Campbell, H. F. Strangulated Ventral Hernia. Southern Med. and Surg. Journal. Vol. XIII., N. S., p. 131. 1857.
- Camper. Demon. Anat. Path. 1760.
- Camper. Icones Herniarum.
- Carroll, T. Vaginal Rectocele and Vaginal Hernia. Western Lancet. Vol. XVII., p. 321. 1856.
- Chadwick, James R. Rare Forms of Umbilical Hernia in the Fetus. Reprint from Vol. I. Gynecological Transactions. Boston, 1876.
- Chancellor, C. W. Diaphragmatic Hernia. Amer. Journal Med. Sciences. Vol. XXX., N. S., p. 404. 1855.
- Chase, Heber. Treatise on the Radical Cure of Hernia by Instruments. Phil., 1836.
- Final Report of the Com. of the Phil. Med. Soc. on the Construction of Instruments, etc. Phil., 1837.
- Cheever, D. W. Clin. Lect. in Bost. Med. and Surg. Journal. July, 1866.
- Chopart. Traité des Malad. Chir. Tome I.
- Chopart et Desault. Parisian Surg. Journal.
- Clark, J. C. Strangulated Crural Hernia. Western Lancet. Vol. XII., p. 613. 1852.

- Cloquet, J. *Recherches Anatomiques sur les Hernies.* 1817.
 Colles, A. *Treatise on Surgical Anatomy.* Part I.
 Cooper, Astley. *The Anatomy and Surgical Treatment of Abdominal Hernia.*
Anatomical and Surgical Treatment of Inguinal and Congenital Hernia.
 Folio. London, 1804.
The Anatomical and Surgical Treatment of Crural and Umbilical
Hernia. 1807.
 Cooper, Sam. *Surgical Dictionary.* 8th Ed.
 Curling, T. B. *Practical Treatise on Diseases of Testis.* London, 1843.
 Czerny, V. *Beitrag zur operativen Chirurgie.* Stuttgart, 1878.

D.

- DA COSTA, J. M. *Medical Diagnosis.*
 Darling, W. *Essentials of Anat.* 1880.
 Darrah, William E. *Drawings of the Anatomy of the Groin.* Folio. Phil.,
 1830.
 Delorme, R. *Dict. de Méd.* XV.
 Demaux, De. *L'Evolution du Sac Hernaire.*
Ann. de la Chir. Française étrangère. 1842. Tome V.
 Desault. *Œuvres Chir.* Par Bichat. Tome II.
Traité des Malad. Chirurg. Tome I.
 Dieffenbach's *Operative Chirurgie.* Band II., p. 621.
 Dionis. *Cours d'Opérations.* 1777.
 Divoux. *Disp. de Hernia Vesicæ.* 1732.
 Dowell, G. *On Hernia.*
 Dufour, W. *Treatise on Hernia.* 1819.
 Dupuytren. *Clin. Chir.* Tome I.
Consid. et Obs. Anat. sur la Hernie Fém.

E.

- EDIN. *Med. and Surg. Journal.* Vol. III., p. 240; Vol. IX., p. 159.
 Elder, G. *Notes on Three Successful Cases of Herniotomy.* London *Lancet*,
 1878, II, 657.
 Erichsen's *Surgery.* Edited by Brinton.

F.

- FAHNESTOCK, P. *Strangulated Umbilical Hernia.* *Amer. Journal Med. Sci-*
ence. Vol. XVII., p. 368. 1935.
 Fielitz. *Ein Darm- und Netzbauchbruch.*
 Fletcher, R. *Medico-Chir. Notes and Illus.* London, 1831.

- Folsom, N. L. Strangulated Umbilical Hernia. Boston Med. and Surg. Journal. Vol. XLIX., p. 317. 1853.
 Franco, P. Traité des Hernies, etc. Lyons, 1561.
 Fried, G. A. De Foetus Intestinis. 1760.

G.

- GANT. Science and Practice of Surgery.
 Garengéot. Oper. Chir. Tome I.
 Sur plusieurs Hernies Singulières. Mém. de l'Acad. de Chir. 1743.
 Tomes I. et II.
 Gay, John. On Hernia. 1848.
 Geoghegan, Edw. Commentary on Ruptures. 1810.
 Gerdy. Cure Radicale de la Hernie par Invagination.
 Gerdy, P. N. Remarques et Observations sur les Hernies. Arch. Gén. de Méd. 1836. 2 Série. Tome X.
 Gibson, W. Institutes and Practice of Surgery.
 Gibson, C. B. Strangulated Scrotal Hernia. Stethoscope. Vol. II., p. 139. 1852.
 Gimbernat. Account of a New Method of Operating for Femoral Hernia. Trans. from Spanish by Beddoes, 1795. Germ. trans., 1817.
 Goldschmidt. Practische Erfahrungen über die Behandlung und Heilung der Unterleibs-Brüche.
 Gooch. Chirurgical Works. Vol. II.
 Goursaud. Sur la Différence des Causes de l'Etranglement des Hernies. Mém. de l'Acad. de Chir. Tome IV.
 Goyrand. Sur les Hernies des Enfants. Presse Méd., 1837. Clinique Chir., Paris, 1871.
 Gray, Henry. Anat. Descrip. and Surg.
 Gross, S. D. System of Surgery. Vol. II.
 Guérin, Alphonse. Elém. de Chir. 1864.
 Guérin, J. Cure Radicale des Hernies par la Méthode sous-cutanée. Ann. de Chir. Française et Etrangère. Paris, 1842. Tome V.
 Gunthris. Lehre v. d. Blutigen Operationen.
 Guntz, J. G. Observationes Anatomicæ-Chirurgicæ de Herniis. Libellus. Leipsic, 1744.
 Prolusio Invitatoria in qua de Entero-Epiplocele agebat. Leipsic, 1746.
 Guthrie, G. J. On Inguinal and Femoral Herniæ. London, 1833.
 Guy's Hospital Reports. 1842, Vol. VII.; 1856; 1861; 1841, Vol. VI., p. 232.

H.

- HAHN, J. Strangulated Femoral. Phil. Med. Museum. Vol. IV., p. 26. 1808.
- Haller. Disput. Chir. Tome III.
Opera Minora.
Opuscula Patholog.
- HAMILTON, F. H. Case of Hernia. Boston Med. and Surg. Journal. Vol. XXV., p. 57. 1841.
- HAMMEN. De Herniis. Sugd., 1581.
- HANCOCK, Henry. Operation for Strang. Hernia. London, 1850.
- HANCOCK, H. Remarks on Hernia and Diseases simulating it. London Med. Times, 1878, 11, 514; 543; 597.
- HARRIS, S. D. Strangulated Hernia. Charleston Med. Journal. Vol. VII., p. 19. 1852.
- HEATH. Lancet. 1857. Vol. II., p. 109.
- HEATON, George. The Cure of Rupture. Edited by J. Henry Davenport. Boston, 1877.
- HEATON, G. Strangulated Femoral Hernia. Boston Med. and Surg. Journal. Vol. XXX., p. 35. 1844.
- HEISTER. Instit. Chirurg. et de Herniâ Incarcerata Suppurata non semper Lethali.
- HESSSELBACH, F. C. Disquisitiones Anatomico-pathologicæ de Ortu et Progressu Herniarum Inguinalium et Cruralium. Würzburg, 1816. The original edition was published in 1806.
Beschreibung und Abbildung eines neuen Instrumentes zur sichern Entdeckung und Stillung einer beidem Bruchschnitte entstandenen gefährlichen Blutung. 1815.
Die sicherste Art der Bruchschnitte in der Leiste. 1819.
Ueber den Ursprung und das Fortschreiten der Leisten- und Schenkelbrüche. Würzburg, 1814.
- HEVERMAN. Chir. Operat. Band I.
- HÉVIN. Pathol. et Therap.
- HEWETT, P. Med. Chir. Trans. 1844.
- HEWSON, T. S. Strangulated Umbilical Hernia. Amer. Med. Record. Vol. XI., p. 106. 1827.
- HEY and LEEDS. Infantile Hernia.
- HEY'S Practical Observations. 3d Ed.
- HILDANUS, F. Cent. 5, Obs. 54.
Disputationes Chir.
De Herniis Congenitis. 1749.
Herniarum Adnotationes. 1755.

- Hilton. Med.-Chir. Trans. Vol. XXXI., p. 323.
 History of the Rebellion, United States of America. Surgical Vol. Part II.
 Hitchcock, A. Strangulated Herniæ. Boston Med. and Surg. Journal. Vol. XLV., p. 89. 1851.
 Hoin. Essai sur les Hernies rares et peu Connues. 1767.
 Holmes, Timothy. System of Surgery. Vol. IV.
 Howship's Practical Remarks on the Discrimination and Appearances of Surgical Disease. 1840.
 Huestis, J. W. Strangulated Umbilical Hernia. Amer. Journal Med. Sciences. Vol. XVI., p. 380. 1835.
 Huette, Ch. Médecine Opératoire. 1866.
 Hull, G. A. Nature of Herniæ. N. Y. Med. and Phys. Journal. Vol. IV., p. 435. 1825.
 Hunter, John. Works edited by Palmer.
 Hunter, W. Med. Comment. 1762.
 Hutchinson. London Hospital Report. 1865.

J.

- JACOB ET BOURGERY. Traité Complet de l'Anatomie de l'Homme. Paris, 1830.
 Jalade-Lafond. Considérations sur les Hernies Abdominales, sur les Bandages. Paris, 1832.
 Mémoire sur une Nouvelle Espèce de Bandage à Pelote Médicamenteuse pour la Cure Radicale des Hernies. Paris, 1836.
 James. On Hernia. 1859.
 Jameson, H. G. Strangulated Inguinal Hernia. Maryland Med. Recorder. Vol. III., p. 54. 1832.
 John, J. G. F. De Insolita Calculi Ingentis per Scrotum Exclusionone. Wittenburg, 1750.
 Jones, J. S. Radical Cure of Inguinal Hernia. Boston Med. and Surg. Journal. Vol. XLVIII., p. 510. 1853.
 Jouille. Traité des Hernies.

K.

- KEMPF, M. Operation for Radical Cure of Right Reduc. Inguin. Hernia. Louisville Med. News. 1878. Vol. VI., pp. 215, 217.
 Key, Aston. On Hernia. 1833.
 Kingdon. Mechanism and Causes of Hernia. Med. Chir. Trans. 1864. Vol. XLVII.
 Kirschbaum. De Hernia Ventriculi. 1749.
 Knox, Robert. The Ligaments. Edin., 1834.
 Kok, P. S. De Herniis. 1872.

L.

- LABREY, D. J. Observations sur les Hernies accompagnées d'autres Maladies Graves. Journ. Compl. der Diet. des Sei. Méd. Paris, 1819. Tome V.
- La Faye. Cours d'Opérations de Dionis. 1777.
- Lafond. Considérations sur les Hernies Abdominales. 1821.
- Lane, R. Case of Herniæ. Amer. Journal Med. Science. Vol. XXV., N. S., p. 560. 1858.
- Langenbeck, C. J. M. Commentarius de Structura Peritonei, Testiculorum Tunicis, eorumque ex Abdomine in Serotum Descensu ad illustrandam Herniarum Indolem, 1817.
Bibl. für die Chir. Band IV.
Neu Bibl. Band II. 1819.
- Langier. Diet. de Méd. En 30 Vols. Paris, 1837. Tome XV.
- Larrey. Mém. de Chir. Mil. Tome IV.
- Lassus. Pathologie Chir. Tome I. 1809.
Méd. Opér. Tome I.
- Lawrence, W. On Ruptures. 3d Ed.
- Le Blane. Nouvelle Méthode d'opérer les Hernies, avec un Essai sur les Hernies. Par M. Hoin. 1767.
- Le Dran. Traité des Opérations de Chir. Observations de Chir. Obs. 57.
- Leonard, W. T. Radical Cure Inguinal Hernia (Truss). N. O. Med. and Surg. Journal. Vol. XV., p. 378. 1858.
- Le Quin. Le Chirurgien Herniaire. Paris, 1697.
- Levet. Obs. sur la Hernie de la Vessie. In Mém. de l'Acad. de Chir. Tome II.
- Lionet. De l'Origine des Hernies.
- Littre, Observation sur une Nouvelle Espèce de Hernie. Mém. de l'Acad. des Sciences. 1700.
Sur une Hernie Rare. Same Work. 1714.
- Lobstein. Dissert. de Hern. Congen.
- Louis, Réflexions sur l'Opération de la Hernie. Mém. de l'Acad. de Chir. Tome IV.
- Luke. Medical Gazette. Vol. 1.
Cases of Strangulated Hernia reduced en masse. Medico-Chirurgical Trans. Vol. XXIV., XXVI., and XXXI.

M.

- MABBOX. Strangulated Hernia. Rev. de Mim. De Med. mil. Par. 1878. XXXIV. 461-467.
- Major, F. Searification of Inguinal Canal. Western Lancet. Vol. XVII., p. 321. 1855.

- Malachgeiger. *Kelegraphia sive Descriptio Herniarum eum earundem Curationibus, tam Medicis quam Chirurgicis.* 1631.
- Malgaigne. *Leçons de Clinique sur les Hernies.* 1841.
- March, A. *Strangulated and Reducible Herniæ.* *Western Lancet.* Vol. XIII., p. 373. 1852.
- Marshall, Henry. *Contribution to Statistics of Hernia among Recruits for the British and Conscripits for the French Army.* *Edin. Med. and Surg. Journal.* 1838.
- Mauchart. *De Hern. Incarc.* In *Halleri Disp. Chir.* Tome III.
- McPheeters, W. M. *Peritonitis simulating Strangulated Hernia.* *St. Louis Med. and Surg. Journal.* Vol. XV., p. 366. 1857.
- Meckel. *Tractatus de Morb. Hern. Congénito.*
- Medical-Chirurgical Trans.* 1859.
- Medical Observations and Inquiries.*
- Mery. *Mém. de l'Acad. des Sciences.* Paris, 1701.
- Mondierre. *Memoir in Archiv. gen.* Sept., 1834.
- Monro, A. *Crural Hernia,* 1803.
- Morbid Anat. of Human Gullet, Stomach, and Intestines.* *Edin.,* 1811.
- Anat. and Chir. Works.*
- Monroe, Alex. *Outlines of Anat.* 1813.
- Monteggia. *Instituz. Chir.* Tome III.
- Moore, E. B. *Strangulated Inguinal Hernia.* *Boston Med. and Surg. Journal.* Vol. XLVII., p. 525. 1853.
- Moreau. *Sur les Suites d'une Hernie Opérée.* *Mém. de l'Acad. de Chir.* Tome III.
- Morgagni. *De Sed. et Caus. Morb.* Epis. 43, art. 13.
- Morton, Thomas. *Surg. Anat. of Perinæum.* London, 1838.
- Muscroft, S. C. *Strangulated Femoral Hernia.* *Western Lancet.* Vol. XVIII., p. 637. 1857.

N.

- NAPHEY's *Surgical Therapeutics.*
- Neale, R. *Medical Digest. A Book of Bibliographical Reference.*
- Nélaton. *Elémens de Path. Chir.* Tome IV.
- Nessi. *Instituz. Chir.* Tome II.
- Neubaver. *Dissert. de Epiploo-Oschoecoele.*
- Nott, J. C. *Radical Cure of Hernia.* *N. O. Med. and Surg. Journal.* Vol. XVI., p. 474. 1859.
- Radical Cure of Hernia by Leaden Ligature.* *Amer. Journal Med. Sciences.* Vol. XIV., N. S., p. 402. 1847.
- Nuek. *Obs. de Chir.* Tome II.
- Nuttall. *British Med. Journal,* p. 566. 1857.

O.

- OBRÉ. Med. Chir. Trans. XXXIV., p. 233.
 Official Alcohol as a Stimulant. Med. and Surg. Reporter. Aug. 9, 1879.
 Orth, J. Pathol. Anatomy.

P.

- PAGET, J. Surg. Pathology.
 Paletta. Mémor. de l' Instituto. Tomo II., part 1.
 Nova Gubernaculi Testis Descriptio.
 Parisc. Mém. de la Soc. de. Chir. de Paris. 1851. Mém. sur deux Variétés
 Nouvelles de Hernies.
 Parker, W. Strangulated Femoral Hernia. N. Y. Journal Med. Vol. XV.,
 N. S., p. 152. 1855.
 Parrish, J. Strangulated Hernia. Eclectic Repertory and Analytical Review.
 Vol. I., p. 98. 1811.
 Pelletan. Clinique Chir. Tome III.
 Petit, J. L. Chirurgische Wahrnehmungen. Vol. II.
 Œuvres Posthumes. Tome II.
 Traité des Mal. Chir. Tome II.
 Petit, P. (le jeune.) Sur les Hernies de la Vessie et de l'Estomac. In Acad.
 de Chir. Tome IV.
 Peyronie. Observations, etc., sur la Cure des Hernies avec Gangrène. Mém.
 de l'Acad. de Chirurg. Tome I.
 Pfannius, M. G. De Entero-Oschocele antiqua. 1748.
 Pipelet. Remarques sur les Signes Illusoires des Hernies Epiploïques.
 Post, A. C. Congenital Hernia. N. Y. Medico-Chirurgical Bulletin. Vol. I.,
 p. 19. 1832.
 Pott's Works. By Earle. Vol. II. and III.
 Pouteau. Œuvres Posthumes. Tome III.

Q.

- QUAIN. Jones Anat. Plates. 2 vols.

R.

- RADICAL Operation einer Kindskopfgrossen freien rechtsseitigen Leisten-
 Hernie. Prager Med. Wochenschrift. 1878, 111, 434.
 Ramsey, A. L. Essentials of Anat. 1880.
 Surgical Diagnosis. 1880.
 Ravin, F. P. Mémoire sur la Théorie et la Cure Radicale des Hernies. Arch.
 Gén. de Med. 1831. Tome XXVII.

- Richardson, F. G. Inguinal Entero-Epiplocele. N. O. Med. and Surg. Journal. Vol. XV., p. 683. 1859.
- Richerand. Dict. des Sci. Med. En 60 Vols. 1827. Tome XXI.
- Richert. Archives Générales de Médecine. 1856. Tome VIII.
- Richter, A. G. De Hernia Inearecrata. Göttingen. 1777.
 Traité des Hernies, trad. de l'Allemand. Par J. C. Rougement. Bonn. 1784.
- Richter, E. Zur Lehre von der Unterleibsbrüchen.
- Riege, C. Ueber die Aetiologie der Leisten- und Schenkelbrüche. Berlin, 1878.
- Rindfleisch. Patholog. Histology.
- Riolanus. Anthrograph. Lib. LXXI.
- Roberts, W. H. Injection Oil of Cloves or Tinet. Canth. Souther. Med. and Surg. Journal. Vol. IX., p. 133. 1853.
 Strangulated Hernia. Southern Med. and Surg. Journal. Vol. VIII., p. 533. 1852.
- Robertson, F. M. Strangulated Inguinal Hernia. Amer. Journal Med. Sciences. Vol. XXIX., N. S., p. 127. 1855.
- Roeser. Archives f. phys. Heilkunde.
- Rokitansky, C. Path. Anatomy.
- Ronstan. De quelques Modes de Guérisons Naturelles, etc. Journal de Chir. de Malgaigne. Paris, 1843. Tome I.
- Rossius. Aeta Nat. Cur.
- Rudtorffer, F. X. Abhandlung über die einfachste und sicherste Operationsmethode eingesperrter Leisten- und Schenkelbrüche. 2 Bände. Wien. 1808.

S.

- SABATIER, Médecine Opératoire. Tome I.
- Saltzman. Disp. de Vesicæ Urinariæ Hernia. 1712.
- Sandifort. Observ. Anat. Pathol. 1777.
 Icones Herniæ Inguin. Congen. 1781.
- Sanson, L. J. Dict. de Med. et de Chir. Pratiques. Paris, 1833. Tome IX.
- Searpa, Antonio. Neue Abhandlungen, u. s. w.
 Sull' Ernie Mémoire Anatomico-Chirurgiehe, 1819.
 Trans. into French. By Cayol, 1812.
 " " English. By Wishart. Edin. 1814.
- Schindler. De Herniis Observ.
- Schmidtman. Von einem geheilten Magenbruch.
- Schmucker. Chir. Wahrnehmungen. 1774, 1789.
 Vermischte Chir. Schriften.

- Schreger, B. G. *Versühe Chir.* Tome I.
Versühe zur Vervollkommung der Herniotomie. Nürnberg, 1818.
- Schwalbe of Germany used Ethylic Alcohol. See No. 61, 1879, of the *Allgem. Med. Central Zeitung*, Berlin.
- Sciler, B. G. *Observationes nonnullæ Testiculorum ex Abdomine in Scrotum descensu et Partium Genitalium Anomalis.* 1817.
- Sharp, E. S. *Operations and Critical Inquiry.*
- Sherrill, H. *Strangulated Inguinal Hernia.* N. Y. *Medico-Chirurgical Bulletin.* Vol. I., p. 20. 1832.
- Skey, F. C. *Operative Surgery.*
- Simon, F. *Gnérison Radicale des Hernies*, 1841.
- Smith, Henry H. *Surgery.* Vol. II.
- Smith, Nathan R. *Surg. Anat. of Arteries.* 1835.
- Smith, Stephen. *Operative Surgery.*
- Snead, N. *Cases of Hernia.* *Transylvania Journal of Med.* Vol. II., p. 525. 1829.
- Soemmering. *Über die Ursache der Brüche am Bauchen und Becken, ausser der Nabel und Leistengegend.* 1811.
- Solly, S. *Surgical Experiences.*
- Spanton, W. D. *Immediate Cure of Inguinal Hernia.* 1881.
- Stanley. *Trans. of the Path. Soc.* Vol. III., p. 94.
- Stepheus, Henry. *On Obstructed Hernia.* 1829.
- Stevenson, S. *Three Cases of Hernia Reduced by Unusual Methods.* *Med. and Surg. Reporter.* 1878. XXXIX., 373.
- Stewart, F. C. *Knife for Strangulated Hernia.* *Amer. Journal Med. Science.* Vol. V., N. S. p. 497. 1843.
- Stone, W. *Observations on Herniæ.* N. O. *Med. and Surg. Journal.* Vol. XV., p. 79. 1858.
- Strangulated Hernia relieved by stretching the Abdominal Rings.* *Med. and Surg. Reporter*, Oct. 18, 1879.
- Strangulated Hernia treated by New Method.* *Med. and Surg. Reporter*, Oct. 25, 1879.
- Suc. *Traité des Bandages.* Paris, 1746.
- Sully. *Surgical Operations.*
- Syme, J. *Fascia of Groin in Edin. Med. Journal.* No. 81.

T.

- TAUSTG, W. *Strangulated Inguinal Hernia.* *St. Louis. Med. and Surg. Journal.* Vol. XII., p. 404. 1854.
- Teale, J. P. *Practical Treatise on Abdom. Hernia.* London, 1846.
- Tebay. *Med. Times and Gaz.* Vol. II., p. 270. 1852.

- Tenon. Acad. des Sciences. 1764.
 Thierry. Des Diverses Méthodes Opératoires pour la Cure Radicale de Hernies. 1841.
 Thurmeissen. De Hernia Ventriculi. 1777.
 Tivy, W. J. Successful Case of Wood's Operation. Brit. M. J. 1878. 11, 559.
 Todd, C. H. In Dublin Hosp. Rep. Vol. 1.
 Trask, J. D. Strangulated Inguinal Hernia. Amer. Journal Med. Sciences. Vol. XVIII., N. S., p. 90. 1849.
 Travers, B. Injuries of Intestines. 1812.
 Trüstedt, F. L. De Extensione in Solvendis Herniis Cruralibus Incarceratis prae Incisione Praestantia. 1816.

V.

- VAN BUREN, W. H. Strangulated Scrotal Hernia. N. Y. Journal Med. Vol. X., N. S., p. 56. 1853. Rep. N. Y. Path. Soc. 1853.
 Velpeau. Edited by Mott. Vol. III.
 Verdier, P. L. Recherches sur la Hernie de la Vessie. In Mém. de l'Acad. de Chir. Tome II.
 Traité Pratique des Hernies. Paris, 1840.
 Vesalins. De H. C. Fab. Lib. V.
 Vidal. Pres. Méd. Tome I.

W.

- WAGNER. Manual of General Pathology.
 Walther. De Hernia Crurali. 1820. Nova Acta Erud. 1738.
 Ward. On Strangulated Hernia. 1854.
 Warren, J. C. Strangulated Crural Hernia. Communications Mass. Med. Soc. No. II., part 2, p. 44. 1790.
 Warren, J. M. Surgical Observations.
 Warton. Adenograph. Cap. 11.
 Watson, J. Radical Cure of Reducible Hernia (injection Tinct. Canth.). N. Y. Journal Med. Vol. IX., N. S., p. 290. 1852.
 Weber, J. E. Radical Cure of Inguinal Hernia (Wutzer). N. Y. Journal Med. Vol. XII., N. S., p. 30. 1854.
 Wheelwright, J. Hernia through a Laceration of Diaphragm. In Med. Chir. Trans. Vol. VI.
 Wilmer. Prac. Obs. on Herniæ. London, 1788.
 Wilson, Erasmus. Anat. Plates. 2 vols.
 Wishart. Treatise on Hernia.

Wood, John. On Rupture. 1863.

Application of Trusses to Hernia. London, 1878.

Wood, T. Strangulated Hernia. Western Lancet. Vol. XI., p. 417. 1850.

Hernia. Western Lancet. Vol. XII., p. 273. 1851.

Wrisberg. Comment. Reg. Societ. Göttingen, 1778.

A FEW OF THE OPERATORS ON HERNIA.

Obsolete Topical Applications.

Fabricius de Aquapendente.

Lanfranc.

Verdue.

The Prior of Cabriere.

Babynet.

Mlle. Devaux.

A. Paré.

Arnaud.

Belmas.

Compression.

Celsus.

Galen.

Leonidas of Alexandria.

Theodorus Aetius.

De Salicet.

Norsia.

Blegny.

Trécourt.

Petit.

Rareton.

Juville.

Fournier.

Beaumont.

Duplat.

Position.

Ravin.

Rivière.

De Hilden.

Reueaume.

Arnaud.

Fedran.

Hey.

Rieck.

Cauterization.

Aetius.

John, son of Serapion.

Avicenna.

Franco.

Albucasis.

Roger.

Brunnes.

Guy de Chauliac.

Petrus de Bonanti.

Jean de Crepatis.

André de Montpellier.

Pierre d'Orliat.

Little John.

Maget.

Gauthier.

Monro.

Incision.

Arnaud.

Lieutaud.

Le Blanc.

Bertrand.

Excision.

Paulus.

Celsus.

Bertrandi.

Lanfranc.

Arnaud.

Schmucker.
Langenbeck.

Ligature.

Celsus.
Saviard.
Desault.
Dupuytren.
Guy de Chauliac.
Martin.
Nott.
John Wood of King's College
Hospital, London.
Sir W. Fergusson.
Erichsen.
T. Bryant.
W. D. Spanton.

Carbolized Catgut Ligature.

Chas. Steele.
Joseph Lister.
H. O. Marcy.
Annandale.
Czerny.

Suture.

Celsus.
Thomas Wood of Cincinnati.
G. Dowell.
Octavius White.
S. R. Beckwith.

Castration.

This operation was mostly in the
hands of quacks.

Gilded Point.

Buchwall.
Berault.
A. Paré.

Royal Suture.

Fabricius de Aquapendente.

Scarification.

Le Blanc.
Guérin.

Organic Plugs.

Sir A. Cooper
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A. H. Stephens.
Moinichen.
Sculptetus.
Garengot.
Graefc.
Jameson.
Redfern Davies.
Gerdy.
Signoroni.
Leroy.
D. Hayes Agnew.
Belmas.
Dupuytren.

Acupuncture.

Bonnet.
Mayor.
Wurtzer.
Mosmer.
Rotlmund.
Sigmund.
Spencer Wells.
Armsby.
Riggs.
Hachenburg.
Malgaigne.

Injection.

Joseph Pancoast.
Desault.
Velpcau.
W. H. Roberts.
Woogencraft.
Bowman.
Geo. Heaton.
Schwalbe.
J. Mason Warren.
Jos. H. Warren.
Wm. Janney.
H. S. Grceno.
W. H. Heath.

And many others.

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RECOMMENDATIONS AND REVIEWS

OF THE

AUTHOR'S LABORS AND STUDIES IN DEVELOPING
THE SUBJECT OF HERNIA.

NOTICES OF FIRST EDITION.

53 UPPER BROOK STREET,
GROSVENOR SQUARE, Feb. 7, 1881.

DEAR DR. WARREN, — I have to thank you for your book, which I have carefully gone over, and I can see that you have bestowed much time and work in its preparation. I only hope you may have pointed out a way for us to work in and radically cure hernia. I am now looking up the case of mine you operated upon at Guy's, and as soon as I can find time I will report the case in full in the *London Lancet*.

Your herniotome and rotary wedge needles and catheters I like much.

With kind regards, believe me, sincerely yours,

THOMAS BRYANT, F.R.C.S.

58 BEACON STREET, BOSTON.

MY DEAR DR. WARREN, — I have to thank you for your kindness in presenting me a copy of your very interesting work on Hernia, which I have already glanced over, and anticipate reading with much interest.

I am, yours very truly,

JOHN C. WARREN, M.D.

I would sincerely thank you for the service you have done to the profession in openly, clearly, and fully making known and describing an innovation in surgery of considerable value, but which had by others been so long and so shamefully kept a mystery and a "secret."

Yours very truly,

HENRY A. MARTIN, M.D.

27 DUDLEY STREET, BOSTON, MASS.,
Jan. 21, 1881.

35 WIMPOLE STREET, W., Jan. 31, 1881.

DEAR DR. WARREN, — On my return from Rome, I find your comprehensive monograph on Hernia. I must at once, without delay, send you my best acknowledgments for the kind and too flattering position you have accorded to me in connection therewith. Be assured I highly appreciate it.

I see the work is fully illustrated, and enters on your experience and views relative to your system of applying injection. This I hope to devote some early leisure to investigate. I shall be interested in seeing and in trying your new instrument (the Thompson American catheter). I am always surrounded by strangers and visitors, and shall be happy to give it a trial.

Meantime, with best wishes, believe me, yours very truly,

HENRY THOMPSON, F.R.C.S.

In addition to these, letters of commendation have been received from Prof. S. D. Gross, M.D., LL.D., D.C.L., from Prof. C. E. Brown-Sequard, M.D., LL.D., and from many others.

Pages 5-8 lacking

its basis is the generation of an amount of inflammatory disturbance at the hernial seat sufficient to close the opening with plastic adhesions. This is the key to its successful practice, and it is not only evident that this prerequisite varies in every case, but also that a large amount of time, ingenuity, and experiment must have been expended in order to meet it favorably in any case, thus giving adequate reason for the unsatisfactory results that were obtained in the early history of the operation.

Some space is also devoted to a discussion of kelotomy, and important suggestions are made for the modification and improvement of this operation. A full bibliography of hernia completes the work.

It is a valuable and interesting production, and we express the hope that it may find its way into the library of every practitioner in the land.

From Peoria Medical Monthly.

The method of subcutaneous injection has given a larger percentage of cures than any other. It is safe, for no fatal results have yet occurred from it; and we think that, from the exact and lucid description and explanation given by Dr. Warren, any man of good anatomical knowledge and surgical experience may make it successfully. At any rate, we hope this book may bring it fully and prominently before the profession, that it may be carefully tested, and its merits decided upon.

We can confidently recommend this work to our readers as one of the most interesting and instructive ever brought to our notice.

From Buffalo Medical and Surgical Journal.

The author has improved the operation, and perfected and invented new instruments. The operation deserves more attention than has heretofore been granted it.

From Michigan Medical News.

While this book contains a general consideration of the whole subject of hernia, its anatomy, and the various operations for its relief,—its distinctive feature is the consideration of the operation for radical cure of reducible hernia by subcutaneous injection. This operation is

based on advanced ideas regarding the susceptibility of the peritoneum to wounds. The liability to peritonitis after wounds of the peritoneum is not so great as was formerly supposed.

To those desiring a full consideration of this important procedure in the treatment of hernia we commend this book. Dr. Warren has identified himself very closely with the operation, and has, by his successful performances of it, both in this country and in Europe, won for himself the right to speak authoritatively regarding it.

From *Philadelphia Medical Bulletin*.

This work sheds a remarkable degree of light upon the history of the various operations performed for the cure of hernia, the great bugbear of surgeons of the past and present. In regard to the operation as now improved and performed by Dr. Jos. H. Warren for some years past, and in numerous cases with brilliant results, we think the very highest honor is due for his untiring energy in striving to perfect an operation which had fulfilled so much, and which, as now practised by him, must prove an unqualified boon to the profession, as it already has to those who were suffering from hernia, and who have passed from his skilful hands cured.

The work contains a valuable instructive table on the differential diagnosis of hernia. The author's description of the several forms of hernia, inguinal, oblique and direct, femoral, umbilical, ventral, &c., evinces the fine anatomist and skilled surgeon.

The work is amply illustrated with fine wood-cuts and diagrams of clinical cases and instruments used, of which among the latter prominently stands forth the syringe, devised and used by the author in making subcutaneous injections for the perfect cure of hernia. Also, valuable chapters on the performance of herniotomy and on the application of trusses.

This effort on the part of the author to arouse fully the attention of surgeons throughout the land to this great achievement will, no doubt, command that thoughtful consideration and following which it so eminently merits.

From *Southern Medical Record*, Atlanta, Ga.

The difficult subject of hernia is here treated in an able and lucid manner, and the new suggestions and new instruments presented will

give to the work especial interest. The practitioner, and especially the surgeon, will find it a most useful and valuable addition to the medical library.

From *New England Medical Gazette*.

Dr. Warren has made many contributions to medical journals, has invented several new instruments for facilitating it, and has compounded a fluid for injection which he considers superior to Dr. Heaton's *Quercus alba*. His book is elaborate, introducing, besides this special operation, a great deal of general information on hernias.

He has produced a very interesting as well as valuable book, which we hope will have a large sale, and spread the knowledge of this beautiful operation.

From *North Carolina Medical Journal*.

We have read this book with great interest. It should be carefully read, as it has peculiar merits, among others a marked degree of individuality. We trust this operation may have a fair trial.

From *Nashville Journal of Medicine and Surgery*.

This admirable work is an exposition of the treatment of hernia by subcutaneous injections and concise descriptions of all the operations for the radical cure of hernia. The plan is simple, devoid of danger, and generally successful. It is certainly worthy of trial, and we hope that in a few years it will be established as a generally accepted surgical procedure.

The book is well written, well illustrated, and well published.

From *Medical Journal*, Edinburgh, Scotland.

In this book Dr. Warren has favored the profession with an account of his method of treating hernia by injecting a stimulating fluid into the tissues which immediately surround the apertures, and so promoting closure by the effusion of plastic lymph.

The operation consists of several stages, — first, the complete return of the hernia; next, the insertion of a fine hypodermic needle (which is blunt-pointed to prevent injury of important structures), from which

a few drops of an irritating fluid is injected into the cellular tissue at the internal and external ring, and also along the canal (in oblique inguinal hernia). As a result of this operation inflammation is set up (as in the case of an injected hydrocele), which lasts for some days, during which time the patient is kept in bed, and cold applied over the inflamed and swollen part. To give the irritated textures opportunity to become agglutinated, the patient must be kept in bed for a fortnight or three weeks. We recommend this operation to practical surgeons for a fair trial.

We found our recommendation mainly on an anatomical fact which Dr. Warren points out, and which, though it is not new to any one, is apt to be forgotten by surgeons, from the manner in which they are accustomed to speak of the hernial openings as "rings." The fact is this, that these so-called rings are not rings at all, but have their walls in contact (generally), except when they are separated by the hernial protrusion. It seems natural enough, when we remember this fact, that if we can irritate these tissues in such a manner as to make their opposing surfaces become covered with plastic lymph, their subsequent fusion together is merely a question of rest and time.





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